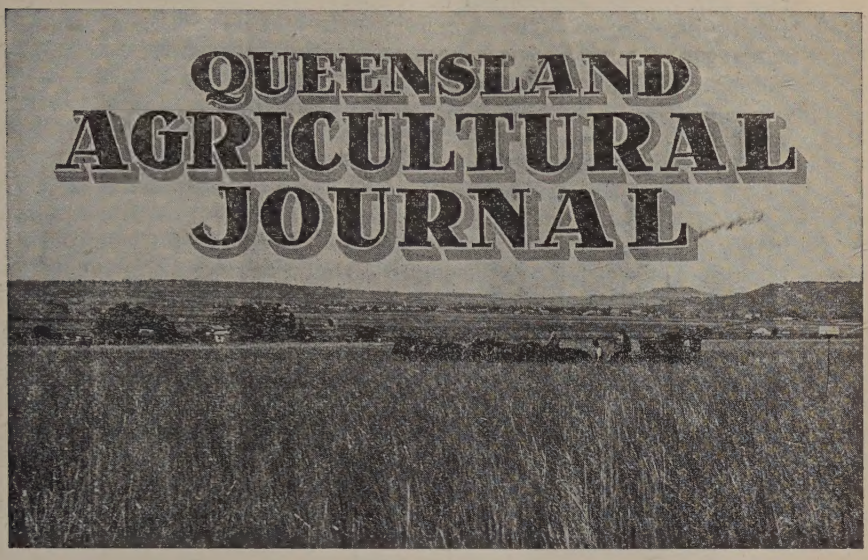
ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



VOL XLII. 1 NOVEMBER, 1934. PART 5.

Event and Comment.

Development of Agriculture in Queensland.

IN the course of his reply in the debate on Supply in the Legislative Assembly, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said—

> Perhaps the most gratifying feature of the protracted debate on this vote is the eulogy that has been paid by all hon. members on both sides of the Committee to the very excellent staff in the Department of Agriculture and Stock. As the Minister in charge of that department, I very heartily corroborate everything that has been said. Of course, there is nothing spectacular about the work that our officers are doing. The ordinary layman does not realise the research work that is being proceeded with, for instance. Such words as plant pathologist, entomologist, and agrostologist are to them but names. The men engaged in this particular phase of research are modesty personified, certainly not through any lack of capacity. They are infrequently brought in contact with the public. They are men of a calibre which ranks very highly in the scientific agricultural world of Australia. They are men of whom Queensland may well be proud. There is certainly a more generous recognition to-day of the work of these men in Queensland than perhaps was ever the case before. That corresponds with the alteration that is taking place in the public outlook in regard to primary production. There is not a member of this

Committee who does not remember the time when the average primary producer was referred to in such terms as "cocky," "clodhopper," "wayback," and "rustic." Terms of that description carry some suggestion of a sneer, but fortunately they are falling into disuse. The economic factors of our national life are causing the public generally to view the farmer in his proper perspective, and while we know that that attitude has had little association with the social phases of agriculture, as a department, yet it is to the material good of the whole of the community that this change has taken place.

I have detected a new note creeping into the debate on this occasion, a note that I welcome, a note that finds a ready response in my own mind, that note being that with but few exceptions there is a more generous recognition on the part of members of the value of science in agriculture. Two hon. members suggested that the development of agriculture to-day was entirely a scientific matter. I agree, because if we review the question generally we find that practically every country in the world that has effected a progressive agricultural policy has solved the cultural problem within its own territory. The main problem is not, therefore, one of production, but of distribution. But associated with that question of production is always the question of the reduction of overhead expenditure by the application of new methods. It is true that the old maxim that was generally accepted, unfortunately, by the farming community a generation or so ago, "What was good enough for my father is good enough for me," has now been reversed, so that the average young progressive farmer realises the dependence on science of agriculture, the alliance between cultural operations and economic facts as apart from economic theories. These things have been recognised by the younger generation, who realise that agriculture will not reach its proper social, political, or economic plane until such time as there is a recognition by all sections of the community of their interdependence. The eulogy that has been accorded to the science officers of my department is very gratifying.

Wood Taint in Butter.

REFERRING to the question of wood taint which was raised in the course of the debate, Mr. Bulcock said:—

Quite frequently Queensland butter has been prejudiced in London, not in consequence of the actual incidence of wood taint, but because of the suggestion that it is there. It is doubtful whether wood taint has ever been a problem so far as Queensland butter overseas is concerned; but it is true that implication has frequently been made, and the suggestion that Queensland butters have wood taint is the reason why this product has not succeeded as well on the London market as it would have succeeded had that not been the case. The Commonwealth Government insist on all butter-boxes being sprayed. The matter is beyond our control. I believe the dairying industry generally is antagonistic to this Commonwealth regulation; but the Commonwealth controls exports, and so long as the Commonwealth controls exports—and that, of course, will be as long as there is a Commonwealth—then we shall have to subscribe to the regulations laid down. If we do not agree with the principle, we at least have to acquiesce in it.

Pasture Improvement.

MR. Bulcock then went on to speak of the work of his department in pasture improvement, and remarked:—

The hon. member for Cooroora (Mr. Harry F. Walker) raised the question of pasture improvement. Personally, if I were asked what I could eliminate from my department and if there had to be a progressive elimination, the last thing eliminated would be our work of pasture improvement. At this juncture pasture improvement is the most important work upon which we are engaged. It means, of course, the adaptation of grasses to different soils and climatic conditions. It means a more extensive testing over that long coastline that we have, and it means an intensive search for economic grasses over this area. The hon. member for Cooroora will be gratified to know that our pasture experimental work is guided by a very excellent pasture experimental committee embracing not only officers of the department but also experienced men recruited from outside the department to assist us by their guidance and counsel, and that it enlists also the active co-operation of progressive farmers throughout the State. These instruments are being used for an intensive and vigorous pasture improvement policy. We have pasture improvement work in progress at Daintree, the most northern point in this State where dairying is engaged in. I am assured that Daintree, which is within the tropics, is the closest centre to the equator in the world where dairying is done. That alone is justification for embarking on experiments in that particular locality. If we examine the needs of every locality we find that each has some problems peculiar to itself. These problems have to be examined.

Departmental Literature.

COMMENTING on further favourable criticism of his department, Mr. Bulcock said:—

A good deal of reference has been made during the course of this debate to the "Queensland Agricultural Journal" and its place in the agricultural literature—I use that word advisedly—of our State. Queensland has new problems to face. Differences in climatic conditions, rainfall, and soil types are to be found in different localities. Therefore, we have had to evolve our own literature in connection with all branches of primary production. How well that evolution has been directed and what loyal support has been given by officers of the Department of Agriculture have been evidenced by the favourable tributes that have been paid to the editor of the journal and the staff who have contributed its articles; but I think that it will be agreed that there is one thing that is missing in the agricultural literature of our State. It is true that Ministers of all political parties have recognised the value of pamphleteering; but, after all, that has only a limited value; pamphlets go out of print. We have no classical productions on agricultural possibilities and agricultural processes in our State. I am sure hon. members generally will be pleased to hear that the officers of my department at the present time are compiling an agricultural handbook similar to the agricultural handbook published, I think, in every other State in the Commonwealth, and a handbook that will have special reference to Queensland conditions and will be an invaluable guide to farmers who require an immediate answer to the more perplexing questions with which they are confronted.

The Importance of Tobacco Mosaic.

By L. F. MANDELSON, B.Sc.Agr., Assistant Plant Pathologist.

MOSAIC is a common disease of tobacco wherever it is grown, and no doubt the the characteristic mottled effect of leaves of diseased plants is familiar to most tobacco growers in Queensland. It has been the experience in the past in other countries, and the same tendency is already noticeable in Queensland, that the true importance of this disease is not realised. This is particularly the case when new areas are opened up for tobacco production, as in Rhodesia[2] and in Queensland. Under such conditions inexperienced growers tend to regard this disease merely as an interesting abnormality and fail to realise that, under certain circumstances, it may considerably reduce the market value as well as yield.

Tobacco mosaic has been intensively studied since 1885, when Mayer first discovered that it was a transmissible disease. A considerable amount of this work has been of a fundamental nature since mosaic, which is a virus disease, was the first of this important group of animal and plant diseases to be studied. Many practical aspects of mosaic have also been investigated since its discovery because of its importance as a tobacco disease. Consequently, there is no great need at the present time for original research in Queensland into this well-known trouble. However, it is essential, at this stage of the development of the tobacco industry, that the potential dangers of mosaic should be stressed, and that growers should be made familiar with some of its more important aspects, and with control measures which have given satisfactory results in other countries.

The object of this article is to discuss these various points. Its preparation has been prompted by the fact that some rather striking photographs have just been obtained which appropriately illustrate the harmful effects of mosaic infection. The photographs are of plants used in a recent successful glasshouse infection experiment, and were obtained by the kind co-operation of Messrs. W. J. Sanderson and A. A. Salmon, of the Photographic Branch of the Department of Agriculture and Stock.

Symptoms of Mosaic.

The most obvious symptom of the disease is the characteristic mottling with dark and light green areas irregularly distributed over the leaf surfaces, as is well illustrated in Plate 224. Since it is only leaves which are developed subsequent to infection which show these markings, it is on leaves produced on the upper portion of the plant, or on sucker growth, that these symptoms are most frequently observed. The irregular distribution of the green colouring matter of the leaf blades is associated with uneven growth and consequent buckling and distortion of the leaves. The shape of affected leaves may be quite irregular, varying from long narrow leaves only slightly wider than the mid-rib to leaves of abnormal width and irregular outline. These abnormalities may be observed in Plate 225. Affected leaves are usually thicker and more brittle than normal leaves. Spotting, which persists in the cured leaf, is frequently associated with mosaic mottling.

Symptoms which are sometimes less obvious are dwarfing of the plants, reduction in size of individual leaves with consequent loss of weight, and delayed maturity. These symptoms of mosaic are illustrated

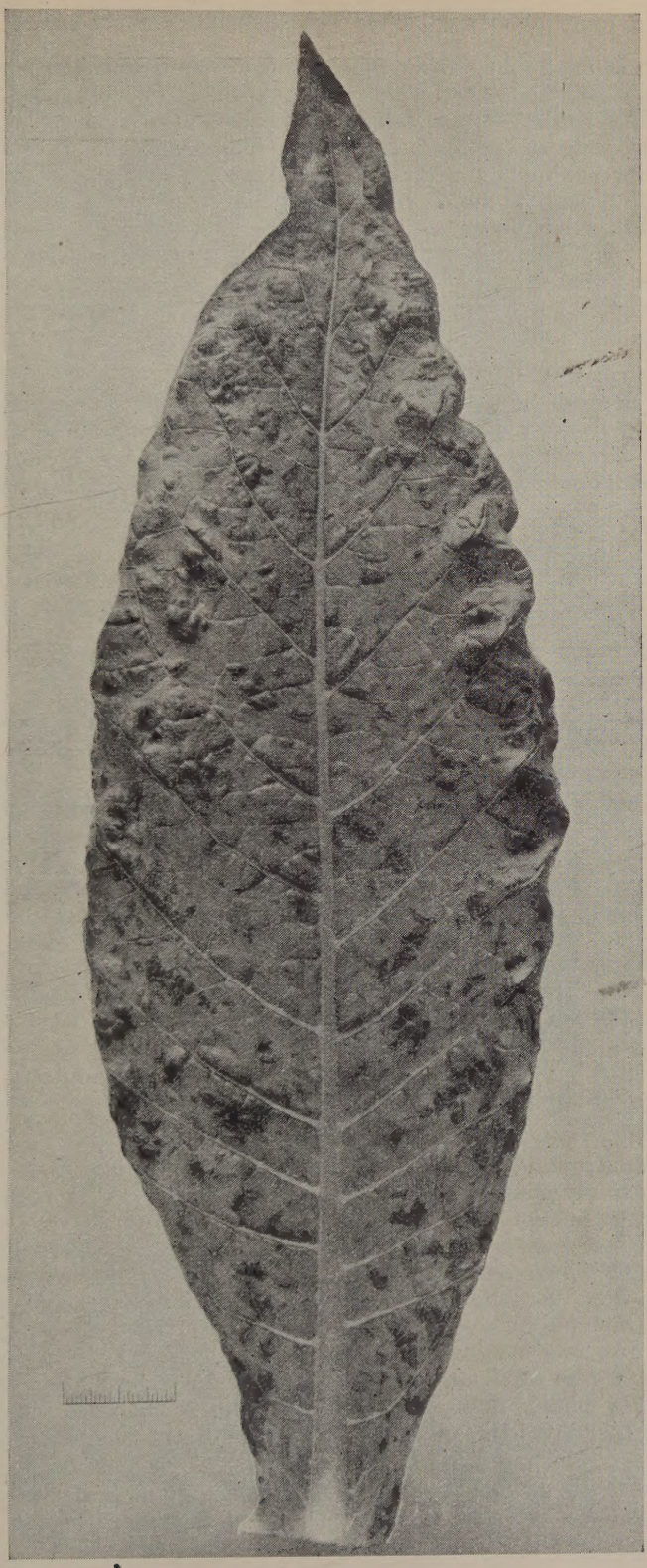


PLATE 224.
Tobacco leaf showing characteristic mottling of mosaic infection.

in Plates 225 and 226. These show healthy plants and plants which were artificially infected when very young with mosaic obtained from diseased leaves collected more than a year previously. Both healthy and diseased plants in each photograph are the same age. It will be noted that five weeks from the time of inoculation the young diseased plants shown in Plate 225, were considerably stunted and distorted. Three months after inoculation an even greater contrast was evident, as shown in Plate 226. This picture clearly shows how mosaic delays maturity. It will be noted also that the diseased plant, besides being much shorter, has developed leaves which are distorted and much smaller than corresponding leaves of the healthy plant.

The severity of mosaic symptoms, and the losses caused by the disease, depend on the age of the plants when infection occurs. The younger the plants when infected the more harmful will be the ultimate results. This infection experiment gives some idea of how harmful these results may be when plants are infected at an early stage.

Furthermore, careful observations in America have recently indicated that mosaic infection not only reduces the yield but also reduces the quality of the cured leaf. Such leaf is uneven, and hence difficult to grade, and its colour is adversely affected as it tends to be dark or to have a greenish cast.

Effect on Yield and Quality.

This important aspect of mosaic disease has been investigated in regard to various types of tobacco in the United States during the past six or seven years.

In 1927 Valleau and Johnson,[5] working with White Burley tobacco in Kentucky, investigated the effect of inoculating plants when being set out in the field and also at topping time. After curing, the leaves were graded and their value estimated by a commercial warehouse. The results showed that when infection occurred at setting-out time, the leaf, as compared with that from healthy plots, was 3 or 4 inches shorter, the yield was reduced by approximately a third (33 per cent.), and the value by two-fifths (43·1 per cent.), on a given weight of leaf. Reference to Plate 226 suggests that the yield might well be reduced by a third under these conditions. The reduction in value per acre was estimated at 61·7 per cent. When plants were not inoculated until topping there was found to be no reduction in yield, but the value of the crop was reduced by approximately a quarter (25·1 per cent.).

McMurtrey[4] reported in 1928 experiments covering a three-year period with Maryland tobacco, which also indicated that both the yield and quality of the crop could be very adversely affected by mosaic, especially when infection occurred shortly after transplanting. In his experiments plants were inoculated either on setting out, one month later, or at topping. Results indicated that inoculation at transplanting time reduced the yield by a third (33 to 35 per cent.), and the gross value of the crop per acre by more than a half (55 per cent.). The damage was almost as severe when plants were inoculated a month after transplanting. When plants were inoculated at topping time the yield was not significantly reduced, but the quality of the crop was appreciably lowered.

As recently as 1933 Wolf and Moss[7] reported a similar investigation extending over two seasons with flue-cured tobacco in North Carolina.

PLATE 225.

Tobacco seedlings on 23rd August. Healthy plant on left, mosaic-infected plant on right. The latter was artificially inoculated with mosaic virus on 17th July. Note stunting, distortion, and blistering of leaves.

Their experiments confirmed those carried out with other types of tobacco, which showed that mosaic adversely affects both yield and quality. It was found that—

(*a*) When plants were inoculated at transplanting the yield decreased by approximately a third (31·4 per cent.), and the value per acre by a half (54·6 per cent.);

(*b*) When inoculated a month after transplanting the reduction in yield and value was almost as great (30·1 per cent. and 42·1 per cent., respectively); and

(*c*) When inoculation was postponed until topping the yield was decreased by about a sixth (17·2 per cent.), and the value by almost a quarter (23·8 per cent.).

They observed that mosaic was rarely as severe under natural conditions in North Carolina as in (*a*) or (*b*) of the above experiment, but sufficient mosaic may be present in crops to cause losses in excess of those produced when crops were artificially inoculated at topping.

So far under Queensland conditions mosaic has not been observed to be very general prior to topping, except in some individual crops. After topping, however, it may be very generally distributed, particularly in certain districts, such as Bowen. As yet no carefully controlled experiments have been carried out to estimate the actual decrease in yield in Queensland, but judging from those discussed above the total losses are probably much greater than most growers would imagine.

The Nature and Dissemination of Mosaic Disease.

Mosaic is a virus disease. That is to say, it belongs to a group of extremely infectious diseases which are not caused by any organism that can be definitely demonstrated. Mosaic may be produced by the sap from a diseased plant being introduced into a healthy plant, even though the sap has been passed through a filter so fine as to prevent the passage of germs or bacteria. Consequently, the disease is readily transmitted by handling during various cultural operations and by sucking insects. In this connection it is interesting to note that mosaic is more prevalent in Maryland[4] than in most of the tobacco areas of America, and this is probably due to the fact that there the previous season's crop is usually on the farm while the new crop is growing. Under such conditions workmen who grade tobacco and then handle the growing crop are apt to introduce the disease by carrying infection from one to the other.

Mosaic may affect many other plants beside tobacco. In fact, recent investigation[1] has shown that the host range of this disease now includes no less than twenty-nine species of families other than the Solanaceæ, the family to which tobacco belongs. Consequently, tobacco may become affected by infection being carried to it from one of several crop plants and weeds. For instance, tomato plants are frequently affected with mosaic, and so quite possibly the unusual prevalence of mosaic on tobacco in the Bowen district may be associated with the extensive cultivation of tomatoes in that area.

Mosaic usually originates from the seed-bed. Should one or two seedlings be affected and no precautions taken many other plants will eventually become inoculated during the processes of weeding and

planting out. The disease may exist for a considerable time on old infected tobacco refuse in the soil. Hence, if the seed-bed soil is not properly sterilised some plants may contract the disease from that source. The disease may be introduced from affected crops or weeds in the vicinity of the beds by workmen or insects. Furthermore, as has been already suggested, it may be carried to the seed-bed on the hands of workmen who have handled infected tobacco trash or cured leaf. Again, it has been demonstrated that active tobacco mosaic virus may exist in manufactured tobacco.[6] Hence infection could be introduced on the hands of a smoker. In some parts of America where cured tobacco is commonly chewed, and in Rhodesia where natives who tend the beds make their snuff from tobacco suckers, it is considered that the disease is frequently introduced by these agencies. Even if all the seedlings are perfectly healthy when transplanted, however, some infection may occur subsequently in the field from the remains of a previously affected crop in the soil, should that have been affected with mosaic.[3]

In Queensland where early priming is practised for the control of frog-eye, there is a danger of further distribution of the disease. As demonstrated by the experiments discussed above, it is when plants are inoculated during the seedling stage, and during the first month after transplanting, that they are most seriously affected, and consequently the greatest care should be practised up to this stage. Finally, during topping and suckering operations, still further dissemination of the disease may take place, and consequently it is not unusual to observe a large proportion of suckers showing mosaic symptoms.

Control.

In view of the foregoing remarks, certain precautions suggest themselves for the control of this disease. These precautions may be briefly summarised as follows:—

1. Destroy infected material in the seed-bed soil by efficient soil sterilisation, and avoid the introduction of any tobacco trash after the soil has been sterilised.

2. Eradicate any weedy patches which may occur in the vicinity of the beds, since many plants, weeds and otherwise, may carry the mosaic virus. Particular attention should be given to solanaceous plants.

3. At the commencement of the season all seed-bed equipment should be new or suitably sterilised.

4. After handling any tobacco, cured or otherwise, the hands should be thoroughly washed with soap and water, which will remove the mosaic virus, before working on the seed-beds.

5. The beds should be very carefully examined periodically for the presence of mosaic. Should it be observed, affected plants, as well as those in the vicinity, which may also be affected, should be removed. After handling such plants the hands should be washed. If a large proportion of seedlings are affected, which is unlikely, it would be advisable to abandon the bed and destroy the plants.

6. Examine the seedlings when lifting from the bed, and discard any showing suspicious symptoms. Thoroughly wash the hands in soap and water before proceeding with the work.

7. When the plants have become established in the field make a careful examination for mosaic before commencing priming operations and remove all diseased plants. If this precaution is neglected, and plants are inoculated during early priming, they are apt to become very seriously affected.

PLATE 226.

The same plants as shown in Plate 225 on 12th October. Note flower heads of healthy plant, and small distorted leaves and general stunting of mosaic-infected plant.

8. Make periodic examinations for mosaic since plants may contract the disease from contaminated soil in the field, or from infection by workmen or by insects.

9. Should the disease be serious in the field, and should it persist, notwithstanding the above precautions, then it would be advisable to practise a rotation of crops in which tobacco and other susceptible plants are not grown for a year or more.

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PLAIN TURKEY PROTECTED.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) has called attention to a Press statement which apparently emanated from Mr. G. H. Barker, State Secretary of the Royal Australian Ornithologists' Union, to the effect that the plain turkey is to be protected closely for two years.

The Minister points out that the statement might convey an erroneous impression that it is intended to apply continuous protection to the plain turkey for the period mentioned, which, however, is not the case. It is intended to rigidly enforce the present protective periods, and to prosecute any offenders. As Mr. Barker has apparently misunderstood the information conveyed to him by the Minister, the text of the communication is supplied herewith:—

"In connection with the desire of members of your Union for total protection to be afforded the plain turkey, I have to inform you that it has now been decided to issue general instructions to officers of this Department and the Police that the protective provisions of "*The Animals and Birds Acts*, 1921 *to* 1924," relating to that bird, should be rigidly enforced during the close season, and that any breaches of the Acts should be reported for action by the Department against offenders.

"At present the periods of protection in this State are as follows:—

Southern Queensland (No. 1 District).—From the 1st October in each year to the 30th April in the following year, inclusive.

Central Queensland (No. 2 District).—From the 1st December in each year to the 30th June in the following year, inclusive.

Northern Queensland (No. 3 District).—From the 1st November in each year to the 31st May in the following year, inclusive

"In addition to the provision of partial protection as above, the plain turkey is totally protected in the Shires of Eacham, Tinaroo, and Woothakata, on the Cairns hinterland.

"Prior to the date on which the protective period will expire in the ensuing year, information will be sought as to whether the measures at present in force for the protection of the plain turkey are adequate."

Queensland Pine Beetle.

By A. R. BRIMBLECOMBE, Assistant to Entomologist.

BORER damage, occasioned to seasoned hoop pine manufactured into furniture or erected as walls, floors, or other structures, has been well known in Queensland for a considerable number of years. Until the end of 1931 the damage in all available records was attributed to a species of Anobium, namely—*Anobium punctatum* De Geer. At that date newly bred specimens of the common Queensland borer, as well as the series already in the collections, were found to belong to a totally different species which Mr. Henry Hacker, who is now in charge of the Departmental collections, identified as *Calymmaderus incisus* Lea. A thorough examination and dissection of a large series of borer-damaged hoop pine specimens was then made by the writer, and revealed in every case dead adults of the latter insect. Thus, since the type of damage was prevalent and *Anobium punctatum* was absent from the collections, it appeared certain that Anobium could be considered of little or no consequence in Queensland, and the transference of responsibility for damage to *Calymmaderus incisus* seemed reasonable.

However, in November, 1933, a hoop pine floor exhibited damage somewhat dissimilar to that of *Calymmaderus*, and on dissection of the boards dead adults and living larvæ were secured. These adults proved to be *Anobium punctatum*. This, then, is the first authentic Departmental record of that insect as a timber pest in Queensland. Recently a further record was obtained when a damaged board, extracted from a piano, revealed on dissection dead adults of this insect, the timber being of foreign orgin. In spite of these records, *Calymmaderus incisus* is still considered to be of greater economic importance in this State.

The European furniture beetle, *Anobium punctatum*, is of almost world-wide distribution. Consequently, it has been discussed in numerous publications both in Australia and abroad, and the present article is accordingly intended to deal primarily with *Calymmaderus incisus*, but because of their systematic affinity and the similarity in damage and control the two insects will be compared and contrasted.

Early Records.

The first reference in Queensland literature to Anobium damage occurs in the annual report of the Department of Agriculture and Stock for the year 1897-8, wherein Mr. Tryon notes "Introduced pine wood, Anobium beetle (?Theca sp.), Brisbane." Other early records occur in similar reports for the years 1898-9, 1902-3, 1905-6, 1907-8, 1910-11, and 1918-9. The first reference to a specific host appears in 1910-11, wherein Mr. Tryon reports, "Pinhole borer (Anobium sp.), white pine, *Araucaria cunninghamii*, Redland Bay and Brisbane, where it is becoming very prevalent and proving highly destructive."

Although *Calymmaderus incisus* was not described until 1924, it is quite likely, from the evidence just given, that some of the above early records refer to this insect. At any rate, specimens in the collections obtained from *Araucaria cunninghamii* in 1921 and placed under Anobium sp., have now been identified as *Calymmaderus incisus*; so this insect can be regarded as a pest of long standing.

Mr. Robert Veitch, Chief Entomologist, made, last year, the first reference in literature to the economic status of this species.[1]

Timber Attacked.

With one exception all the timber specimens from which the Queensland furniture beetle has been obtained, together with the flooring board which produced *Anobium punctatum*, on being submitted to the Forestry Sub-Department, were returned with the identification in every case as *Araucaria cunninghamii*—i.e., Queensland hoop pine. The single exception was a specimen of New Zealand white pine, *Podocarpus dacrydioides*, which was found to be heavily infested by Calymmaderus.

Roughly and Welch[2] give a list of Australian timbers, also one of exotic timbers, which are liable to Anobium attack. Of the Australian species, hoop pine is the only one so far confirmed in Queensland. W. W. Froggatt[3] reports that *Anobium punctatum* does not attack Australian timbers. Overseas, a variety of woods, such as alder, beech, birch, fir, dead ivy branches, oak, pine, spruce, and willow, are listed as hosts. Zacher[4] records it as eating holes in linen tablecloths.

Age and Nature of Timber Attacked.

Well-seasoned timber, as exemplified in buildings many years old, is the most liable to Calymmaderus attack. The older the wood the more favourable it seems to be. Specimens harbouring living larvæ possess an equilibrium moisture content of about 12 per cent., although this degree of dryness is not claimed as the only factor conducive to attack. Timber, in ageing, changes slightly in chemical composition, which fact might exercise a selective influence on gravid females.

The timber from which Anobium was recently taken was reputed to be forty years old and had an equilibrium moisture content of 12 per cent., while Calymmaderus is breeding in a house supposed to be more than thirty year old. With both insects, once infestation has occurred, reinfestation may proceed, producing several generations from the same site, until the wood is reduced to a honeycombed mass, when attraction declines.

Nature and Extent of Damage.

A piece of infested timber sliced longitudinally exhibits an admixture of various sized holes, which illustrate the nature of the grub's progress. The minute holes are practically all cut transversely, indicating that a newly-hatched grub from an original infestation tunnels perpendicularly to the surface. The larger tunnels are exposed in all directions. The more mature grub, by avoiding cutting into earlier-formed portions of its own tunnel or severing the tunnels of other individuals, travels wherever sufficient solid wood permits, and accordingly its course is exceedingly devious. At all times it avoids breaking the exterior surface. This, however, is punctured by the beetles when emerging from the pupæ a year or more after egglaying. It is evident, then, that in instances of original infestation the first external indications of depredation are the exit holes of the adults, but, unfortunately, in the meantime damage will have been effected, for the preceding grub stage does all the internal tunnelling. In Plate 227, figs. 2 and 4, the portions illustrated reveal only a few exit holes, whereas the underlying damage is extensive; so the number of holes is of little significance in estimating the severity of attack. The beetles, after emergence, do no more actual harm to the timber.

PLATE 227.

Fig. 1 (top left).—Hoop pine damaged by *Calymmaderus incisus*. Lateral view of portion in Fig. 2 showing thinness of outer shell.

Fig. 2 (top right).—Hoop pine heavily damaged by *Calymmaderus incisus*.

Fig. 3 (bottom left).—Hoop pine damaged by *Anobium punctatum*.

Fig. 4 (bottom right).—Hoop pine showing internal damage and exit holes of *Calymmaderus incisus*.

Attack is not necessarily confined to any particular part of the timber. Whether it is sapwood or truewood, the final degree of damage is the same, although in a few instances the proportion of exit holes from the first generation was greater in that part of the board nearer the sapwood. Board to board grub dispersal may occur, but not extensively, and cumulative infestation of timber is almost invariably due to egglaying by the beetles. While the degree of initial infestation varies, it is generally light, although in one instance a ceiling exposed to a large population of beetles became infested in practically every board and for the whole length of the boards. Usually, general infestation obtains only with the progress of succeeding generations. If the insect remains unchecked the whole hoop pine interior of a building may become affected. Ultimately the infested wood is reduced to a honeycombed spongy or crepe rubber-like mass covered by a thin shell punctured by exit holes (Plate 227, fig. 2). So great has been the damage in many instances that hoop pine furniture and shelves have collapsed, and floors have broken under the weight of heavy furniture, while a lead pencil may be pressed through heavily infested floors and walls. A heavily damaged board 6 inches wide and $\frac{3}{4}$ inch thick snapped in the hands almost as easily as a match splinter.

The above information is also fairly true of Anobium, except that the damaged timber has not the same spongy nature. Anobium tunnels may be devious, but there is a greater tendency for them to be parallel to the surface and to one another (Plate 227, fig. 3).

The Calymmaderus damage is characterised and may be identified by the frass (Plate 228, fig. 2) with which the grubs fill the tunnels. This consists of undigested material and rejected particles which, intermixed, fill the tunnels closely but not tightly, for when exposed it can be easily shaken out. The undigested material is in the shape of small elongate oval pellets, slightly pointed at one end and typically of a very hard consistency. In old hoop pine they are mostly darker in colour than the rejected particles and surrounding wood; the colour difference in New Zealand white pine is not so striking. The proportion of pellets to rejected particles is large.

The frass of Anobium grubs (Plate 228, fig. 1) is somewhat different. The pellets are smaller and of a more crumbly consistency; in old hoop pine they are not different in colour from surrounding wood, and the proportion in comparison with rejected particles is not so large.

Origin and Distribution.

Apparently *Calymmaderus incisus* is indigenous to Queensland; no record of its occurence elsewhere has yet appeared. It was originally described from specimens taken in Brisbane, and it is to this State that its natural host, hoop pine, is indigenous.

Most sections of the Brisbane area have yielded records of Calymmaderus damage, and the beetle population therein is evidently very high. The occurrence of damage in such widely separated towns as Southport, Sandgate, Petrie, Redcliffe, Nambour, Tewantin, Imbil, Gympie, and Maryborough indicates a long range, comparatively near the coast of south-eastern Queensland. Whether it extends within the tropic or to the interior has not yet been ascertained. *Anobium punctatum*, as previously mentioned, is of almost world-wide distribution, and is considered to be native to Europe.

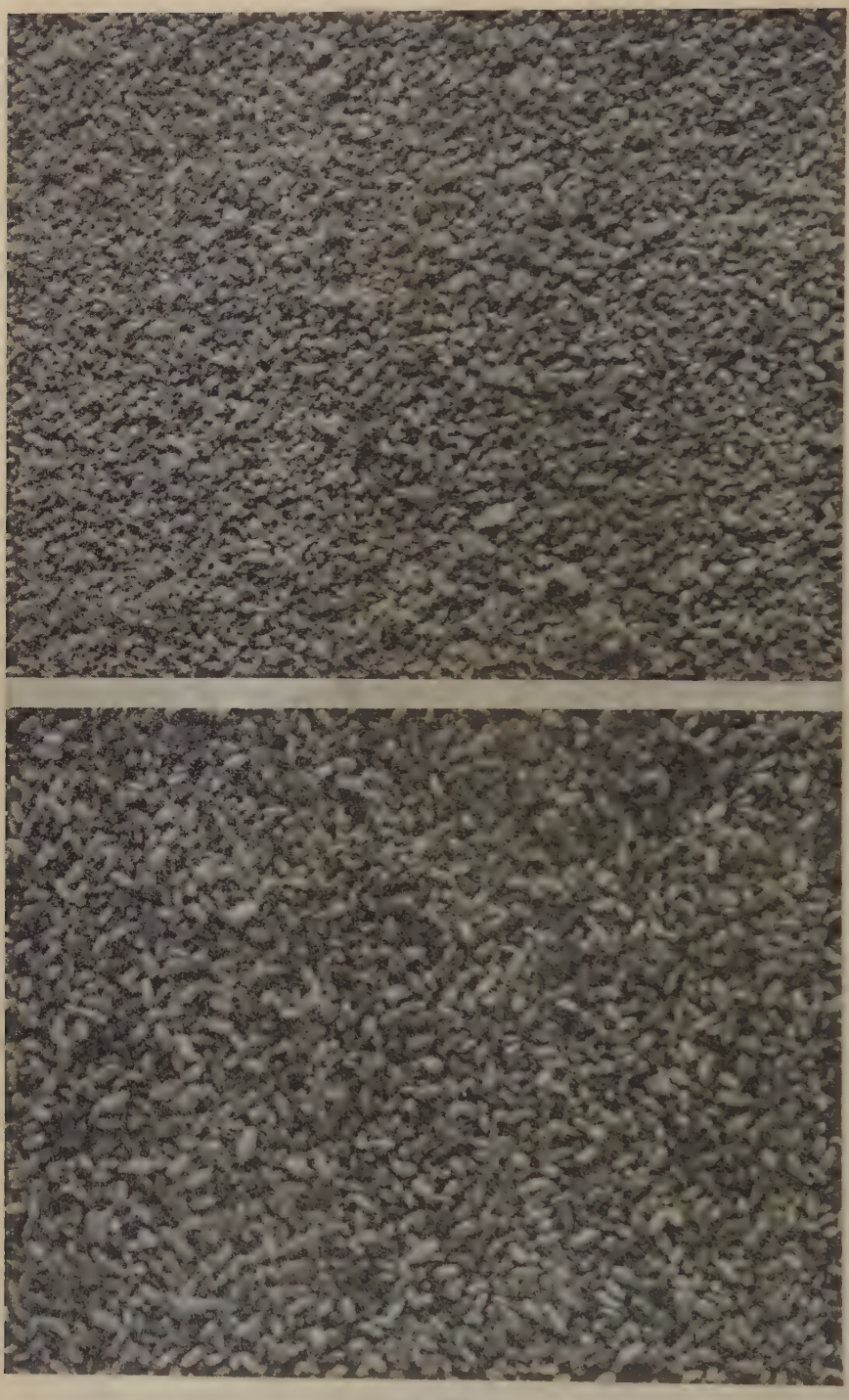

PLATE 228.

Fig. 1 (top).—Frass of *Anobium punctatum* × 7½.
Fig. 2 (bottom).—Frass of *Calymmaderus incisus* × 7½.

Habits and Life History.

The eggs of Calymmaderus in initial attacks are deposited in depressions on the sawn board ends or in cracks in the boards, while the spaces between tongued and grooved boards are particularly attractive for egg-laying. A favourite site for eggs of subsequent generations is within the old exit holes. When placed in cavities on board ends they are below or flush with the surface level. Small openings such as these are chosen possibly because of the initial leverage required by the minute grub in gaining entrance to the timber as well as for protection during incubation. All sixteen eggs laid in the laboratory were deposited in cavities on block ends—three in one opening, four in pairs, and the remaining nine singly. The actual period required to incubate these eggs was not definitely determined, but occupied three to four weeks.

The beetles of Anobium choose similar sites for oviposition. Overseas records show that a single individual may lay from twelve to forty eggs, and the incubation period may occupy about three weeks.

The newly-hatched Calymmaderus larva is minute, and the tunnel it bores is correspondingly small—in fact, is no larger in diameter than the prick of a pin point. It immediately enters the timber in a direction perpendicular to the surface chosen for oviposition wherever that may be, thus working away from the light. Although the optical organs are rudimentary, the perception of light is remarkable, and at all times the breaking of any exposed board surface is avoided. Even very small tunnels deflect the course of the young grub, but to the older ones these present little hindrance. As growth proceeds the grub moults three times, the third moult producing the pupa.

The tunnel to accommodate the grub becomes increasingly larger until the trail left by a mature grub is circular and 1·5 to 2·0 mm. in diameter (Plate 227, figs. 2 and 4). Due to the curved nature of the grub the posterior end, which is studded with a few spines, presses against the tunnel wall, and this causes the dorsal surface, which is provided with bands of spines, to come into close contact with the wall above. Thus there is ensured a keen purchase to enhance the efficiency of the stout, hard jaws which, by chewing off pieces of wood, most of which are swallowed, effect the grubs progress through the timber. When placed on a flat surface the young grub can crawl very slowly, but the older individual in similar circumstances is helpless. Mastication of the hardwood fibres occurs in the muscular gizzard on the inner walls of which are innumerable spines for thoroughly effecting maceration.

Subject to a heavy infestation the wood decreases appreciably in weight, but the actual pieces chewed off do not cause this, for they do not leave the timber. The nourishment taken from them is converted into energy, which is dissipated as the grubs work. This conversion to energy, which is totally lost as far as measurable weight is concerned, is the explanation for diminished wood weight.

When the grub is full grown, its tunnel is usually directed to a suitable position just beneath the timber surface, where a pupal chamber is excavated. Often, however, especially in fairly heavily damaged wood, the pupal cells occur at quite considerable depths. The pupal chamber is oval in shape, 4·0 to 5·0 mm. long, and half as wide. The grub now completely confines itself by sealing the tunnel with fibre fragments and frass glued together in the form of a neat circular concave

cap. After a while it casts its skin, which passes to one end of the chamber, and the insect is now in the pupal stage.

The larval period has not yet been completely determined. This period might be ten or eleven months; however, it is not improbable that it might extend well over a year, since as late as April, 1934, when cool weather was approaching, first and last stage larvæ were both abundant. These first-stag grubs definitely were from eggs laid during the season immediately past: the third-stage grubs must have developed from the previous season's eggs and will not emerge as adults until next spring.

The habits of the Anobium larva are somewhat the same as those of Calymmaderus, except that the tunnels it bores are more inclined to run parallel to each other. Its food has been found to consist chiefly of cellulose, of which the wood cell walls are partly composed. Falck[5] noted a decrease of about 9 per cent. of cellulose in attacked pine sapwood. The larval period under normal conditions lasts for ten or eleven months, but in very warm climates it may be less than six months, whereas in cooler countries it may extend over two years. Pearson[6] had under observation larvæ which had not completed the stage in two and a-half years.

When the insect is about half way through the pupal stage the eyes slowly turn black; later the brown jaws are discernible through the pupal skin; then shortly the whole becomes light-brown, due to the development of the adult within. Eventually the adult splits the skin about the region of the thorax, and as the beetle emerges this skin is pushed along the body and off at the posterior end. However, the adult is still immature, and so rests within the cells, where it slowly darkens in colour and gains in strength. Ultimately, it burrows to the exterior, making the obvious exit hole so indicative of borer presence. For both Calymmaderus and Anobium the pupal period occupies from three to four weeks.

The short resting spell of the adult within the pupal cell is probably of sufficient duration to permit the complete development of the reproductive organs allowing the beetle to commence mating immediately on emergence. Egg-laying, then, can probably be anticipated shortly after the appearance of exit holes. The gravid female wanders over the timber surface, with its antennæ extended, searching for suitable egg-laying sites. On locating a favourable cavity it inserts its ovipositor, which neatly places the egg. As mentioned in an earlier paragraph, of sixteen eggs, three were in the one cavity, four were in pairs; the others occurring singly, the number occurring in each cavity probably being dependent on the size of the cavity. The total egg production possible from a single female is not known. Oviposition may extend over several widely separated sites; and as adults can fly freely, house to house dispersion takes place readily. Great activity becomes evident amongst adults at dusk, and possibly continues into the night, while in a fairly dark room they remain exposed and active even at midday.

A disturbed beetle does not take to flight or scamper away, but a passive disposition is assumed in which it is difficult to say whether the insect is dead or alive. The head is retracted under the cowl-like prothorax, the legs are tightly adpressed to the body in suitable depressions, and the mouth points backwards, enabling the antennæ to fit conveniently into a cavernous sternal groove, completely accommodating

and protecting them. The form now assumed is a small oval solid, which should be effective in resisting external forces. If dropped, a beetle in this passive state immediately takes to flight.

This habit is also common to the Anobium beetle. The head and appendages are retracted, but because of the insects' more elongate form, and the absence of suitable depressions for the legs, the even oval shape of Calymmaderus is not possible. In other general habits the adult Anobium may be likened to that of Calymmaderus.

Seasonal History.

Adults emerge from October to February, over the whole of which period egg-laying occurs. The grubs may continue to tunnel during the winter or may remain dormant for a while, their activity or otherwise depending on the severity of the weather. With the advent of spring, grubs from eggs laid early in the preceding season might give rise to pupæ. Experimental work also indicates that grubs from late eggs might have an extended period continuing into the following summer and not emerge as adults until the second spring. Possibly such factors as climate and condition of wood exercise significant influence on the life-cycle period. Pupation commences in the spring, and by extending into the summer makes available adults at various times during the warmer weather, so oviposition can be expected at any time in the summer.

Anobium is recorded as having normally a yearly cycle, but under warm conditions two generations a year are known[7], whereas in cooler climates the life cycle extends to two years and over[6].

Vernacular Name.

In literature *Anobium punctatum* is referred to as the "furniture beetle," and in Europe is designated the "common furniture beetle." Although its depredations are not confined to furniture, the name is retained because of long usage. Because of the general similarity to Anobium, *Calymmaderus incisus* had provisionally received the name "Queensland furniture beetle." Here again the greater percentage of damage is to wooden structures other than furniture. For this reason, together with the facts that the insect is indigenous to Queensland and has been bred only from pine, it has now been designated the "Queensland pine beetle."

Systematic Position.

The Queensland pine beetle was described as *Calymmaderus incisus* by the late A. M. Lea in "Transactions of the Royal Society of South Australia," vol. 48, p. 53, 1924, from specimens obtained in Brisbane. It belongs to the family Ptinidæ, subfamily Anobiinæ; hence its relationship to *Anobium punctatum* described by De Geer in 1774.

Most members of this subfamily are of economic importance, other well-known species being *Sitodrepa panicea* Fabr., which is highly destructive to numerous dry preserved products, and *Lasioderma serricorne* Fabr., which causes considerable loss to stored tobacco.

The borers Calymmaderus and Anobium must not be confused with the common and notorious "powder post beetle," *Lyctus brunneus* Steph., which belongs to a totally different family of insects and has never been bred from hoop pine.

Description of Stages.

The very small white egg (Plate 229, fig. 1) is ·4 mm. in diameter and is just discernible to the naked eye. The shape is more or less spherical, but that portion of the egg in contact with the timber may assume the shape of the cavity into which it has been placed. The egg shell or chorion exhibits a remarkably pretty reticulate appearance, numerous minute protuberances being present. The egg of Anobium is also minute, white in colour, but oval in shape.

The Calymmaderus grub (Plate 229, fig. 2) is soft bodied, curved, and wrinkled, and is creamy-white in colour except round the mouth, where the mandibles are dark-brown. When full grown it measures 4·0 to 5·0 mm. in length and 1·5 mm. in width, being widest at the thorax, each segment of which is provided with a pair of short white five segmented legs. The anal body segment is broadly rounded and slightly wider than the others, due to a tendency to lateral lobing. The outer portion of the maxilla—i.e., the maxillary palp is four segmented, short, and peg-like, while the inner part is provided with numerous blunt processes, giving it a comb-like appearance. The labial palps are similar to those of the maxillæ. The whole body is clothed with numerous fine hairs. Each segment, from the third thoracic to the fifth abdominal, is provided dorsally on the more elevated portion with a band of brown spines slightly curved backwards at the tips. Posteriorly on each side of the last abdominal segment is a group of similar spines varying from eight to fifteen in number. None of these spines occur in the first-stage grub, while in the second stage they are few in comparison with the last stage, and often are in only one row. A spiracle is situated on each side of the first thoracic and first to eighth abdominal segments, the spiracles being practically uniform in size.

The Anobium larva (Plate 229, fig. 6) is very similar to Calymmaderus in general features. The only obvious difference and a good one distinguishing the larvæ of the two species is that the Anobium grub has eight bands of dorsal brown spines, while Calymmaderus has only six; again the Anobium larva has no spines on the anal segment. Gahan[8] mentions the dorsal spines as being in a double row in Anobium, but a series of grubs recently examined indicates that although there may appear a tendency towards two rows, the arrangement is by no means regular. Sometimes one or three rows are distinct. The same applies to Calymmaderus.

The pupa (Plate 229, fig. 3) is soft, oval, creamy-white, and measures 3·0 to 3·5 mm. in length and 1·5 mm. across the thoracic region. The wing covers fold round to the under side, where they pass between the second and third pairs of neatly folded legs, while the antennæ lie along the side of the body outside the wing covers and above the knees of the first and second pairs of legs. There is no obvious difference in the Anobium pupa except that it is slightly longer.

The Calymmaderus beetle (Plate 229, fig. 4) is oval in shape, 2·5 to 3·0 mm. long, and 1·25 to 1·5 mm. wide, the general colour being a shining bright castaneous. Over the body surface is a minute shining pubescence and numerous minute punctures, neither discernible to the naked eye. When a beetle is specially cleared, a series of punctures arranged in longitudinal rows on the elytra are revealed, while scattered generally over the surface are smaller punctures, from which the pubescence arises. On the margin of each elytron are two distinct striæ.

PLATE 229.

Fig. 1.—Egg *in situ* of *Calymmaderus incisus* × 24.
Fig. 2.—Larva of *Calymmaderus incisus* × 8.
Fig. 3.—Pupa of *Calymmaderus incisus* × 8.
Fig. 4.—Adult of *Calymmaderus incisus* × 15.
Fig. 5.—Adult female of *Pediculoides ventricosus* × 60.
Fig. 6.—Larva of *Anobium punctatum* × 8.
Fig. 7.—Adult of *Anobium punctatum*, × 15.

Antennæ consist of eleven segments, of which the basal one is large, second smaller, third smaller still, but fourth to eighth smallest and about equal in size. The ninth is largest, oblong, and as long as the tenth and eleventh combined, each of which is about equal in length to the first segment. The last three segments give the appearance of a large elongate club clearly visible when the antennæ are extended. Maxillary palps are four segmented, labial palps three segmented; the terminal segment of each is dilated interiorly into a hatchet-like blade. The legs are moderate, and the tarsi consist of five segments—the first largest, the others about equal in size. The fore and mid legs are contiguous, but the mid and hind legs are widely separated by the prominent metasternum. The mesosternum is inconspicuous. The prothorax narrows anteriorly and, dorsally, is simply curved not angled as in Anobium. Impressed into the prosternum, over the whole of the mesosternum, and into the anterior of the metasternum is a common depression for the fore and mid legs when folded. The first abdominal sternite and the hind part of the metasternum provide similar depressions for the hind legs; the first abdominal sternite then appears as a curvilinear triangle, with the apex anteriorly. This apex fits into a corresponding socket in the metasternum. The cavernous sternal groove involves the prosternum and mesosternum, and continues into the metasternum, where it ends abruptly, corresponding with the blunt end of the last antennal segment.

The adult Anobium (Plate 229, fig. 7) differs from Calymmaderus in many respects. In shape it is more elongate, being 4·0 to 5·0 mm. in length, and the colour varies from reddish-brown to dark-brown, modified by a clothing of fine short paler coloured hairs. Clearly visible on the elytra are a series of longitudinal grooves, along which are numerous closely-set punctures. The prothorax in lateral view is distinctly angled or cowl-shaped. The sternal groove is present and continues further into the metasternum, but it is not so cavernous and shallows gradually, corresponding with the tapering last antennal segment. The legs in comparison with Calymmaderus are longer, and although they may be neatly folded, they do not fit into accommodating depressions. The fore and mid legs fit into the angles between the prothorax and elytra; the hind pair fit behind the metasternum since this is slightly larger than the first abdominal sternite. The last three antennal segments are about equal in length and also give a clubbed appearance.

Natural Enemies.

Both the larval and adult stages of Calymmaderus and Anobium are preyed upon by a small mite, *Pediculoides ventricosus* (Newp.) (Plate 229, fig. 5), which also has been recorded from Anobium grubs in Russia[7]. This mite is responsible for the death of quite a number of grubs. As many as twenty-three females and several young mites have been found associated with one dead Calymmaderus larva, six to twelve female mites per grub being common. The beetle larvæ having soft bodies may be attacked anywhere, although on the ventral side under the arched body is preferred. The adults, however, are heavily chitinised except on the upper side of the abdomen under the elytra, and it is here that the mites are usually found. Even so, the percentage of control it exercises is small, because the dispersion and isolation of grubs and adults is not conducive to a general attack by the mites. At the same time the presence of this mite in a dwelling is not really desirable, for

it may attack human beings also. Uncomfortable conditions were experienced by the writer when working with material infested by this mite. This is in agreement with reports in a recent article by Swan[9] in South Australia, who calls it the hay itch mite and who has completely worked out its biology.

Anobium is parasitised by a small hymenopterous wasp of the family Braconidæ. Again the degree of control is not large. Overseas there are recorded several Braconid parasites and a few coleopterous predators of the family Cleridæ and one of the family Trogositidæ.

Artificial Control.

Since the recorded natural enemies give little help in the attack against these borers, alleviation of infestation must necessarily be sought in the application of artificial measures. From the outset it must be recognised that in this respect the problem of control is an extremely difficult one, because the destructive insect stage is well entrenched within the timber and securely protected against ordinary control practices. Even though certain recommendations are outlined below, these are not absolute in efficiency, but if persevered with they will considerably minimise if not eliminate the cause of the trouble. A great disadvantage presents itself in that, when original infestation occurs, there is no indication of its presence, the appearance of exit holes being the first evidence of attack. Even though only a few of these are present, the underlying damage may be extensive, for the grubs have been tunnelling for some considerable time previously. Control efforts, then, must be to take immediate steps to kill the insects remaining in the timber and to prevent reinfestation or spread to new sites.

When to Apply Control.

The salient life history features affecting control are that the female is free-living and causes reinfestation or spreads the attack, eggs are more or less exposed, and young and very old grubs, pupæ, and emerging adults are comparatively near the surface. A control applied at a time corresponding to the insects' presence near the surface should prove beneficial, and such a time is the spring. Control applied during that season should accordingly reduce the number of potential adults. At least one subsequent treatment should be made about six weeks later in order to kill insects which earlier were too deep to be affected and which now should be approaching the outer surface.

Preventive Measures.

In the normal course of events most hoop pine interior walls are now painted and the pine floor stained, but following this the undersurface of the floor and the board ends usually projecting under the building against the beams should receive some protective coating, such as creosote. Any exposed cracks appearing later, due to shrinking of the boards, should be treated with paint or creosote as the case demands. In this way all egg-laying sites are eliminated. Even though floors have been stained above or covered by linoleum, instances of attack are exceedingly numerous and invariably originate from below, which, then, is a vital point in preventing infestation. This can quite easily be completely overcome by substituting for flooring purposes seasoned hardwood, which is as cheap or cheaper than hoop pine.

Combative Measures.

Control in most cases is possible only from the exterior, the best method being to apply some liquid possessing penetrative power and evolving a gas which spreads still further. At the same time it might be possible to include a poison in the mixture used, to become absorbed by the timber, thereby killing any insects chewing the impregnated wood. Several penetrative materials are already on the market or can easily be prepared.

Heavily infested boards may be so reduced in stability as to become dangerous, and these should be removed and burned. Replacements and lightly attacked timber should then be treated. The liquids can be applied by a brush or spray pump, and can be injected into any exit holes by means of a suitable syringe. If only a few holes are showing, injections alone are insufficient on bare boards, as the effect then is only localised; so in any case, brushing or spraying is essential. The best mixture applied to the outer surface unfortunately penetrates to a depth of only about one-eighth of an inch. For this reason each application kills only a proportion of the insects within, hence with repeated treatments at suitable intervals the effects are cumulative. At the same time the coating on the surface renders it unsuitable for further egg-laying.

Methods of Treatment.

Heavy-grade creosote is an effective oil for general application, and is readily available on the market at a relatively low cost. It possesses fair penetrative power and evolves a good concentration of gas, and both liquid and gas effect a kill when they come into contact with living borers. This creosote, however, causes a dark, flat, or dull stain, which in itself is not really objectionable, but the success of subsequent coats of paint, varnish, or polish might be impaired.

The creosote can be diluted with kerosene, a suitable mixture being equal parts of each. This leaves a light stain, and the rate of evolution of the fumes is slightly reduced. A dilution of one part of creosote to eight of kerosene has been recommended, and although this still leaves a very light stain when heavy-grade creosote is used, a good varnish finish is possible with two coats. There is, however, a refined creosote on the market which itself produces little or no stain, and though the rate at which fumes are evolved is said to be very much slower than the heavy grade, it may meet requirements in certain cases.

Kerosene alone might in individual instances prove beneficial, but penetration is not very good on fairly solid timber. The same objection applies to turpentine alone, yet a mixture of these two in equal parts has given more favourable results, although its action is much slower than a material containing creosote, and consequently more applications will be necessary.

Another suitable mixture is paradichlorobenzene dissolved in kerosene, at a strength of 1 lb. of paradichlorobenzene crystals to 1 gallon of kerosene. The liquid, orthodichlorobenzene, used alone might be considered costly, but mixed in kerosene to give a 5 to 10 per cent. solution it makes a reasonably priced mixture. Neither of these preparations leaves any stain.

Painting appears to be the most suitable method of applying the above liquids and entails no special apparatus. Spraying may be more

convenient and quicker if the right pump nozzle is available. Certain nozzles produce a mist so fine that there is little adherence to the timber, while with others considerable splashing results. In all cases the degree of control depends on the thoroughness of the work.

Reasonable care must be exercised in the application of the above-mentioned chemicals, for contact with the skin may induce irritation, and they must not be exposed to naked lights, for the mixtures are inflammable.

Preparations containing soluble poisons, such as sodium arsenite, zinc chloride, or mercuric chloride, do not effect such a rapid kill as one including creosote, for a proportion of the poisoned timber must be swallowed before death ensues. These chemicals are so very poisonous that they are not recommended unless in the hands of skilled workers.

Fumigation is another possible means of control. This is more restricted in its application, since an airtight room or container is essential; for this reason the method is more appropriate to treatment of infested furniture or other comparatively small articles. Carbon bisulphide may be employed exposed in several shallow vessels, or poured over cotton wool or absorbent cloth at the rate of 1 lb. per 250 cubic feet of space. Paradichlorobenzene may be sprinkled at the rate of 1 lb. in 25 cubic feet. Exposure to the fumes must be maintained for several days, or even up to a week, to enable complete penetration of the borer tunnels. When small articles are to be fumigated it might be more convenient to communicate with firms possessing the necessary chamber, of which there are several in Brisbane, and who might treat material at a reasonable cost. Fumigation, although thorough in killing all living insects in the timber, is no guarantee against reinfestation, and a protective coating is therefore necessary.

Summary.

The beetle, *Calymmaderus incisus* Lea, has recently been discovered to be the causal agent of considerable and serious damage to seasoned hoop pine in Queensland. Although not described until 1924, it was undoubtedly responsible for considerable losses at a much earlier date. Its range, as at present known, covers the whole south-eastern portion of this State. All stages have been obtained, and life history work is proceeding in the laboratory, but as yet the life-cycle study has not been completed. Hoop pine and New Zealand white pine are attacked, the timber eventually being reduced to a sponge-like mass. Complete descriptions of habits and stages are given. At present creosote alone, or mixed with kerosene, and painted on affected timber, first in the spring, with at least one treatment later in the summer, is the best method of control.

Anobium punctatum De Geer occurs in Queensland, so far only to a minor extent and only in hoop pine. In this article it is compared and contrasted with *Calymmaderus incisus* in all details.

Acknowledgments.

Thanks are expressed to Mr. Robert Veitch, Chief Entomologist, for granting facilities for this work, and to Mr. I. W. Helmsing, whose excellent illustrations enhance these notes. The writer is also much indebted to several officers of the Forestry Sub-department who have assisted materially in this investigation.

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CLEANLINESS IN THE DAIRY.

Professor J. K. Murray, Principal of the Queensland Agricultural College and High School, said, in the course of a recent address, that the effects of impure water in the manufacture of butter lay mostly in its adverse effect on butter quality, and this arises in the use of such water on the farm in milk production as well as in the factory. The factory was unable to offset entirely the bad effects of dairy farm methods which did not conform with good hygienic practice. Deodorisation, pasteurisation (and its variants such as stassanisation) could remedy only a portion of the ill-effects of farm and transport procedures which, for whatever reason, did not reach a high standard. The watering of cows which allowed of the flanks and udder becoming contaminated from muddy water made it almost certain that the milk would be contaminated by the water residues from the flanks, udder, escutcheon area, and tail. This could be partly offset by the cleaning of the cow's flanks, tail, udder, and teats before milking, but clean watering was an advantage.

The washing of milk pails, strainers, separator parts, cream cans, &c., in contaminated water almost made it certain that the microbes would bring about their undesirable changes in the milk and cream before it reached the factory. Good-quality water should be used, and the immersion of utensils in boiling water for a minute would remove danger from this source. During the earlier stages of the milk's history the putrefactive group might do their most marked work because of the near approach of the milk at that stage to neutrality.

The harmful gas-forming group of bacteria was a notable contaminant of milk when impure water was used or manurial contamination occurred in farm practice. This group could work in milk in which acid was being produced by themselves or other bacterial groups, and was favoured during storage and transport to the factory by the warm conditions prevailing in the Queensland summer. Distinctly off-flavours resulted and gas was produced. Yeast contamination, ropy milk outbreaks, and other phenomena of lesser importance had also been traced to farm-washing waters.

The cooling of cans by dirty wet bags could result in the contamination of milk or cream by dirty water. Prolonged transport allowed of longer activity by organisms derived from dirty water, and the remedy rested in better roads with their lower haulage costs and the more frequent delivery this made possible. Faster rail transport, such as the rail-motor had made possible in connection with some of the factories, lessened the amount of undesirable substances produced before the vast majority of the microbes still forming them were destroyed by pasteurisation.

The passing of the nearest factory by the supplier was, other things being reasonably equal, definitely against the interests of the industry.

The Parasites of Poultry.

By F. H. S. ROBERTS, M.Sc., Animal Health Station, Yeerongpilly.

EXTERNAL PARASITES.

THE external parasites of the domestic fowl include the poultry tick and several species of lice and mites.

THE POULTRY TICK (Argas persicus).

A. B.

PLATE 230.—THE POULTRY TICK (*Argas persicus*) (A) and (B).
A.—Male. B.—Female.

Description.

This is a flat, oval, brownish tick about one-quarter to half an inch in length. The mouthparts are situated ventrally between the front legs, and it is only by turning the tick on its back that these can be seen. It is a powerful bloodsucker, and, like the bed bug, feeds only at night, remaining hidden in cracks and crevices in the fowlhouse during the day.

Life History.

The female tick may lay 500 to 900 eggs during her lifetime, in several batches. These eggs are deposited in sheltered positions, and under favourable conditions may hatch in about ten to fifteen days. The tiny tick that emerges from the egg has only three pairs of legs, and almost immediately after hatching attaches itself to the fowl, preferring the skin on the breast, under the wing, and on the thighs for this purpose. In three to ten days' time it is fully engorged with blood, and, leaving the fowl, seeks a suitable hiding-place, in which it casts the skin, to appear as an eight-legged nymph. There are two further moults before the adult stage is reached, but, like the adult, these nymphal stages feed only at night.

Effect on the Fowl.

When ticks are numerous, their bloodsucking habits result in distinct injury to the birds attacked. This is due to the amount of blood sucked up by the ticks and to poisonous substances injected whilst feeding. Young chickens are most seriously affected, and the weakness caused by the tick may often be fatal.

The fowl tick is also very important, as it is the carrier of an organism which is responsible for fowl tick fever, which is a serious, and usually fatal, disease among fowls.

Control.

This tick is a very difficult pest to deal with, as not only is it resistant to ordinary insecticides, but its habit of hiding in deep cracks, &c., protects it to a very large extent from any spray treatment. A badly infested fowlhouse, if of little value, should be burnt as it stands. As adult ticks are able to live as long as four years in an empty fowlhouse, it is of little use excluding the fowls for any length of time as a control measure.

Crude oil makes a satisfactory spray, and should be forced well into all cracks and crevices, &c. Before spraying, all litter, nesting straw, and loose boards likely to protect the ticks should be removed and burnt. The spraying treatment should be repeated every three to four weeks until no more ticks are seen.

In addition to spraying, fowls may be protected from the ticks if the perches are so arranged as not to touch the fowlhouse walls. They may be swung from the roof on wires or else placed on supports rising from the floor. The perches should be frequently painted with crude oil. Nesting boxes, moreover, should be placed well away from the roosts, and are best constructed of metal.

Special coops should be set aside so that any bought fowls may be quarantined as a precaution against bringing in fresh infestations. The period spent in these coops should be about twelve days, and the coops should be kept thoroughly clean and well sprayed.

LICE.

The lice found on the domestic fowl are all biting lice, and there are at least six species occurring on fowls in Queensland. These various species are given popular names according to the part of the body or feathers on which they are most frequently found—namely, wing lice, head lice, body lice, shaft lice, and fluff lice. The various species are illustrated in Plate 231, figs. 1-6.

Lice infestation is most serious among chickens, and the irritation resulting from their presence may sometimes be fatal. Among grown fowls lice infestation is shown mainly by a decreased egg production.

POULTRY LICE.

Description of Plate 231.

Fig. 1.—Wing Louse (*Lipeurus caponis L.*) × 24.
Fig. 2.—Fluff Louse (*Goniocotes hologaster* Nitzsch) × 24.
Fig. 3.—Slender Pigeon Louse (*Columbicola columbæ L.*) × 24.
Fig. 4.—Head Louse (*Lipeurus heterographus* Nitzsch) × 24.
Fig. 5.—Body Louse (*Eomenocanthus stramineus* Nitzsch) × 24.
Fig. 6.—Shaft Louse (*Menopon gallinæ L.*) × 24.

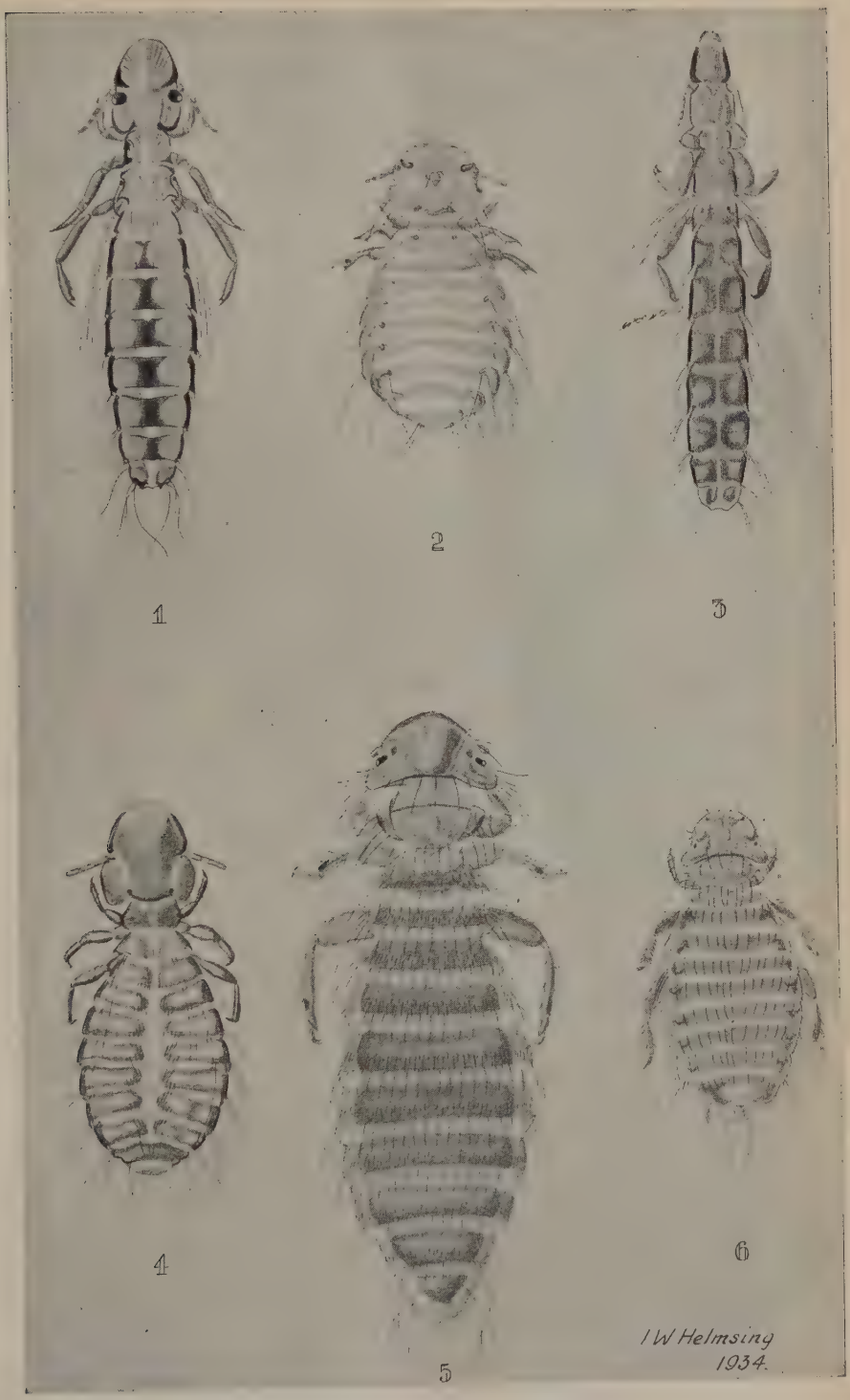

PLATE 231.—POULTRY LICE.

(*For description of Plate see page* 562.)

The two most important lice are the head louse, *Lipeurus heterographus* (Plate 231, fig. 4), and the body louse, *Eomenacanthus stramineus* (Plate 231, fig. 6). The former occurs in the region of the head, and is distinctly injurious to young chicks, and on occasions even to grown fowls. The body louse occurs mainly on grown fowls and causes serious irritation, resulting in unthriftiness and a marked decrease in the egg yield.

Control of Lice.

Lice may be best controlled with sodium fluoride, used either as a powder or as a dip, one treatment, if carefully carried out, being sufficient to kill all lice and their eggs.

Used as a powder, sodium fluoride may be applied in pinches to the base of the feathers in the region of the head, neck, back, breast, vent, wings, tail, and thighs, or it may be mixed with flour in the proportion of three parts of flour to one part of sodium fluoride and applied by means of a shaker.

Where large numbers of fowls are concerned, it may be considered more convenient to apply the sodium fluoride in the form of a dip, 1 oz. to each gallon of water. Only warm, sunny days should be chosen for dipping, and the fowl is plunged into the dip with the wings outspread. The fluid is then worked into the feathers with the fingers and the head ducked once or twice.

THE TROPICAL FOWL MITE (Liponyssus bursa).

PLATE 232.—THE TROPICAL FOWL MITE (*Liponyssus bursa*).

This mite is very small in size, being no larger than a pin's head. It may be seen on poultry at any time during the day and night, and, owing to its bloodsucking habits, is distinctly injurious, especially to chickens and young poultry. Sitting hens may be so irritated by its presence as to leave the nest. On the fowl this mite occurs in greatest numbers below the vent, about the tail, and sometimes on the neck. A heavy infestation gives the feathers a dirty appearance, and the skin becomes irritated and scabby.

The female mite deposits her eggs among the feathers, where the young mites hatch and may complete their life cycle without leaving the fowl.

This is the species usually seen in fowlhouses in Queensland. When in numbers, the mites may crawl onto the arms, &c., of the poultryman, when handling infested fowls or nesting straw, and cause severe irritation. The tropical fowl mite may be transported by starlings, pigeons, and sparrows, and is also concerned with an infestation of houses, popularly held to be due to "starling lice."

Control.

Spraying with crude oil and the burning of all litter and nesting straw is advised. In addition, individual treatment of all fowls by dipping in a mixture of 1 gallon of water, 2 oz. of flowers of sulphur, and 1 oz. of soap is necessary, taking care to wet the feathers thoroughly. Alternatively, dusting with flowers of sulphur will be found satisfactory, but is not considered to be as efficient as dipping.

RED MITE (Dermanyssus gallinæ).

This mite is very similar to the tropical fowl mite in appearance, but, like the poultry tick, feeds only at night, and, with few exceptions —for example, in the case of sitting hens—is not found on the birds during the day. The red mite is also a bloodsucker, and when in numbers may be regarded as a serious parasite. Its eggs are laid in the cracks and crevices in which it hides by day.

Control.

Red mite control may be accomplished by spraying with crude oil and the destruction of all litter. Dipping in this case is not required. Spraying should be repeated every three days till no more mites are seen.

SCALY-LEG MITE (Cnemidocoptes mutans).

This itch mite, as its name implies, is responsible for a condition among poultry known as scaly-leg. Mite attack is usually confined to the legs, though occasionally it has been known to include the comb and wattles. The mites, burrowing in beneath the scales, cause the formation of large crusts. They usually commence their attack between the toes, and gradually extend up the unfeathered portion of the leg. In severe cases the birds become lame and walk with difficulty, and, being unable to scratch, may rapidly lose condition.

Control.

The mites spread mainly by contact or from the perches, so no hesitation should be shown in treating affected fowls. An effective remedy is crude oil, into which the legs are dipped and washed with

a hard brush. The treatment should be repeated after thirty days. The perches should also be painted with crude oil.

DEPLUMING MITE (Cnemidocoptes gallinæ).

This mite lives at the base of the feathers and causes an intense itching, as a result of which the affected bird pulls out the feathers. If the stumps of the feathers are examined, they will be found surrounded with scales and crusts, whose presence distinguishes depluming mite infestation from moulting or the vice of feather-picking.

Control.

Dipping in the mixtures used for tropical fowl mite control is recommended.

INTERNAL PARASITES.

Flukes, tapeworms, and roundworms occur in the domestic fowl, but in Queensland fluke infestation is as yet unknown.

TAPEWORMS.

PLATE 233.
Different species of Tapeworms which are found in the fowl. (Natural size.)

Fowls in this State are infested with at least six distinct species of tapeworms, all of which occur in the intestine. The smallest of these, *Davainea proglottina*, is only about one-eighth of an inch in length, and is regarded as one of the most harmful tapeworms infesting the fowl. It occurs in the immediate anterior portion of the intestine, and requires various species of slugs in which to undergo part of its life cycle.

The largest tapeworm, *Davainea tetragona*, occurs in the lower portions of the intestine and may grow up to 10 inches in length. This species must undergo development in the housefly before its life cycle can be completed.

The other tapeworms infesting the fowl use various species of beetles, earthworms, and grasshoppers as intermediate hosts.

Effect of Tapeworm Infestation on the Fowl.

Heavy infestations are associated with loss of weight, diarrhœa, unthriftiness, and a decreased egg production, young fowls being most seriously affected. Some species, particularly *Davainea proglottina,* are considered by some authorities to cause leg weakness and leg paralysis.

Control.

The most efficient drug for the removal of tapeworms is Kamala. The dose for an adult bird is 1 gram, which should be reduced accordingly for younger birds and in cases of weakness. It is always best to treat individual birds and not attempt to give a mass treatment by mixing the drug with the food. No previous starvation is necessary. To be on the safe side, a few birds only should be treated at first and carefully watched for any ill-effects.

As poultry tapeworms require an intermediate host to complete their life cycle, and as these several intermediate hosts must come into contact with the dung before they become infected, the first step in prevention consists of the regular removal of all droppings and their safe disposal. The droppings should be either burnt or else treated with a strong disinfectant and buried. All litter which provides hiding-places for the beetles, &c., should be destroyed and everything possible done to do away with conditions favourable to the breeding of these intermediate hosts. Boards, stones, &c., are shelter for slugs and should be cleared away. Dampness is another factor favouring some of these intermediate hosts.

ROUNDWORMS.

Several species of roundworms occur in the domestic fowl, the majority of which are found in the alimentary canal.

THE LARGE ROUNDWORM (Ascaridia lineata).

Plate 234.—The Large Roundworm (*Ascaridia lineata*). (Natural size.)

This species is one of the commonest worms infesting the domestic fowl in Queensland. It is found in the small intestine, and may reach a length of 4½ inches, often occurring in very large numbers.

Young fowls are most seriously affected by this roundworm, and infestations stunt the growth and cause such weakness that mortalities frequently occur. Older fowls are not affected to the same extent, but a heavy infection may produce an unthrifty condition and a markedly decreased egg yield.

Life History.

The eggs are passed out in the droppings and under favourable conditions become infective in ten to sixteen days. These eggs, when swallowed by the fowl, hatch in the small intestine, and the young larvæ shortly afterwards penetrate the intestinal wall. Here they remain for about seventeen days, after which they make their way back into the intestine again and grow to maturity, which is reached in about fifty days after the eggs are swallowed.

Control.

The most effective treatment for the removal of this roundworm is the individual dosing of each bird with tetrachlorethylene or carbon-tetrachloride. These drugs may be administered in capsules. The adult dose is 1 cubic centimetre, which must be reduced accordingly in the case of young birds. Care must be taken that the capsules do not break during treatment, as the drug might enter the lungs with fatal results.

Many farmers regard individual treatment as impracticable, and for these the following mass treatments are recommended:—

1. Add to the mash for a period of three weeks 2 per cent. by weight of tobacco dust containing 2 per cent. nicotine. At the end of each week and at the termination of the three-weekly period Epsom salts should be given at the rate of 1 oz. in each gallon of drinking water.

2. Oil of chenopodium may be given after starvation for about eighteen hours in a wet mash at the rate of 1 teaspoonful for every twelve birds. For best results the treatment should be repeated after fourteen days.

Prevention is an extremely important factor in the control of the large roundworm, more especially as treatment is regarded by many authorities as having a serious effect upon the egg production.

The eggs of this parasite are thick-shelled and so resistant to adverse circumstances that in heavily infested flocks the birds are no sooner treated than they become infested again from the contaminated soil of the runs.

Strict sanitation is essential, and the removal of all droppings should be prompt and regular. Enclosed poultry-houses are best kept clean if provided with concrete floors. Special runs should be retained for the use of the chickens. New land is preferable for these runs, but if such is not available, old runs may be prepared by removing the top 6 inches of soil and replacing it with fresh, clean soil.

SLENDER INTESTINAL WORM (Capillaria retusa).

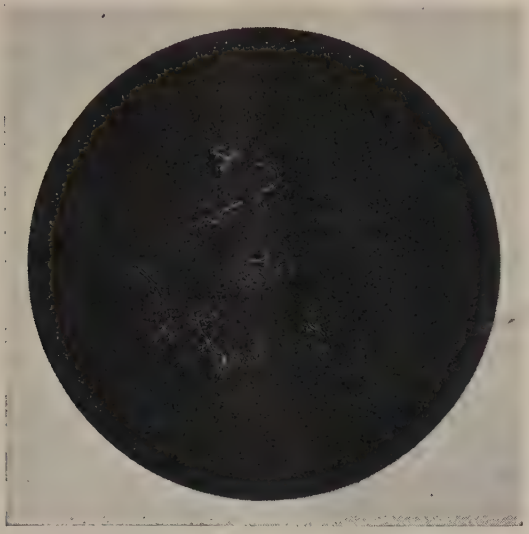

PLATE 235.—SLENDER INTESTINAL WORM (*Capillaria retusa*). (Natural size.)

This species is a hairlike worm, so slender that it may be easily overlooked by the naked eye, and is found in the small intestine. It is sometimes found in immense numbers, and in such cases may seriously affect the health of the fowl.

The life history is a direct one, somewhat similar to that of the large roundworm, though in the case of the slender intestinal worm, the larva is not known to penetrate the intestinal wall.

Individual treatment of each bird with carbontetrachloride or tetrachlorethylene is recommended to obtain the best results, though probably mass treatment as advised for the large roundworm may be expected to give some relief. The measures advised for this species to prevent reinfestation should also be adopted.

CÆCUM WORM (Heterakis gallinæ).

PLATE 236.—CÆCUM WORM (*Heterakis gallinæ*). (Natural size.)

The cæcum worm is an extremely common parasite of the fowl, and is found in the cæcum or blind gut. This is a whitish species growing up to half an inch in length.

Under favourable conditions these roundworms may be present in large numbers in the cæca, sometimes causing, especially in young birds, a serious inflammatory condition of the cæcal walls.

Life History.

The eggs reach the soil in the droppings of infested birds, where under suitable conditions of temperature and moisture they may become infective in fourteen to seventeen days. When swallowed by the fowl, these infective eggs hatch in the small intestine. The tiny larvæ hatching from the eggs make their way to the cæca or blind gut, and in about twenty-four days are fully grown. It was once considered that these larvæ penetrated the cæcal walls, causing the formation of nodules, but recent work has shown that at no time do they leave the lumen of this or any other portion of the alimentary canal.

Control.

The tobacco dust treatment as recommended for the large roundworm is stated to be effective if continued for one month. The preventive measures as advised for this parasite are also recommended.

STOMACH WORM (Dispharynx spiralis).

PLATE 237.—STOMACH WORM (*Dispharynx spiralis*). (Natural size.)

This species is a short, twisted worm, which occurs in the glandular stomach. It is not regarded as a very common parasite, but heavy infestations have been known to occur. When in large numbers, these worms may destroy the glands of the stomach, and in such instances infested birds, while maintaining a ravenous appetite, rapidly lose condition and may die.

Life History.

This stomach worm requires an intermediate host to complete its life history, and this role is played by the small, greyish, many-legged insect-like animals, known as wood lice or sow bugs. These are very conspicuous in damp places, where shelter is provided by piles of litter, loose boards, &c.

Control.

No satisfactory treatment is known, though the individual treatment as advised for the large roundworm should be tried. Strict sanitation must be enforced to prevent infection, and everything possible done to eliminate the presence of sow bugs on the runs, which may best be accomplished by keeping the place free of litter of all types.

GIZZARD WORM (Cheilospirura hamulosa).

PLATE 238.—GIZZARD WORM (*Cheilospirura hamulosa*). (Natural size.)

If a gizzard infested with this roundworm is examined, numerous perforations and brownish areas may be detected on the horny lining. On stripping this lining, burrows will be seen in the muscle wall thus exposed, from which a portion of the worm may be protruding. These worms may grow up to three-quarters of an inch in length and, owing to their burrowing activities in the muscle wall, seriously interfere with the health of the fowl.

Life History.

In this case various species of grasshoppers must be present for the worm to undergo portion of its life cycle, the fowl becoming infected only when it eats these insects.

Control.

There is no treatment known, and control is entirely dependent upon the prompt removal of the droppings and their disposal so that they are not available to the intermediate host.

EYE WORM (Oxyspirura parvovum).

PLATE 239.—EYE WORM (*Oxyspirura parvovum*). (Natural size.)

The poultry eye worm is of interest only to poultry-keepers in North Queensland, as it is unknown south of Rockhampton.

This roundworm may grow up to three-quarters of an inch in length, and is found under the nictitating membrane* of the eye.

The presence of the eye worm causes irritation and inflammation of the eye, to relieve which infested fowls rub the eye against the wing or some other convenient part of the body, and may even scratch the eye with the foot. The eyelids may become inflamed and swollen, and there is a discharge from the eyes and nostrils. The sight is impaired, and if the infestation is not relieved blindness may result.

Life History.

The eggs laid by the female worms in the eye pass down the tear ducts into the throat, are swallowed, and eventually reach the exterior in the droppings. In time young worms hatch out, but before they can become infective to the fowl must be eaten by a species of cockroach. After a period of development in the cockroach, the young worms are ready to infest the fowl, which occurs when the cockroach is eaten. The worms free themselves from their insect host in the mouth of the bird and, passing up the tear ducts, reach the eyes.

Control.

For the removal of the worms from the eyes, a few drops of turpentine are placed in the eye and allowed to act for half an hour. The eyes are then washed in lukewarm boracic water and the worms removed with a camel-hair brush.

Prevention consists in the regular removal of all droppings and the elimination of all litter, &c., likely to provide hiding-places for cockroaches. The use of a good disinfectant as a spray will be found advantageous.

* The nictitating membrane is the thin membrane which passes over the eye when the fowl blinks.

Balanitis in Sheep.

By K. S. McINTOSH, B.V.Sc., H.D.A., Government Veterinary Surgeon.

BALANITIS or "pizzle disease" commonly occurs amongst wethers, and is occasionally seen in rams. It is an inflammation of the sheath or prepuce with the formation of pus. Although non-contagious, it is not uncommon for a large number of sheep to be affected at the same time.

Cause.

To appreciate the cause of balanitis, it is necessary to know something of the anatomy of the part. The penis or pizzle of the sheep extends forwards along the belly to a point just behind the navel, where it ends in a worm-like or vermiform appendage. The free portion is encased in the sheath or prepuce, which is actually an inward fold of skin, being continuous with the skin of the penis. The interior of the prepuce is lined with a modified type of of skin, which does not bear wool or hairs, but has sebaceous glands which secrete a cheesy yolk-like substance. The opening of the prepuce is also situated a little behind the navel, and it is through this opening that the urine pours after emission from the penis.

As the urine of sheep is alkaline, it often contains a fair amount of gritty insoluble substance. When this is passed with the urine it mixes with the sebaceous material, and forms a tough, gritty mass in the prepuce, particularly near the end of the penis. This sets up a marked irritation of the parts, which in many cases is followed by the formation of pus, with swelling and inflammation.

In the case of rams, the penis is frequently protruded, and thus the deposit is not allowed to accumulate, but in wethers and young rams the penis is never protruded, and thus they urinate into the sheath. This is the reason why the disease is more prevelant in wethers and young rams.

If a tuft of wool is left at the opening at shearing time it forms an excellent site for the accumulation of grit and sebaceous material, and when cut with the blades one can feel the grit in the wool.

Removal of the long hairs at the opening during shearing is also a predisposing cause, as these hairs assist in the draining away of urine. Sometimes grass seeds will cause pizzle disease by penetrating the sheath or its opening and setting up pus formation.

Diagnosis and Course of the Disease.

Owing to irritation and pain the sheep becomes uneasy and frequently kicks at the belly as if fly-struck. Sometimes sheep will be seen attempting to bite the pizzle, or they may rub it on stumps, &c.

If left untreated the affected parts swell till finally the animal is unable to urinate. At this stage one of two things may happen: Firstly, the sheep may die owing to retention of urine; secondly, there may be gangrene and sloughing of portion of the affected part, and the sheep will urinate through an opening in the prepuce caused by the slough.

The condition is often accompanied by fly strike.

The sheep falls away in condition, and if treatment is not commenced in the early stages there may be appreciable losses.

Treatment.

In the very early stages the disease may be treated by "ringing" the "pizzle," squeezing out the pus, and syringing the sheath with a lysol solution at the strength of one dessertspoonful to a pint of water. After this the sheath should be syringed every three or four days with a 2 per cent. solution of bluestone (copper sulphate).

In more advanced cases one has to slit open the sheath. This is most conveniently done with a long pair of scissors with one blunt point. The blunt (or ball) pointed blade is passed into the opening, and the prepuce cut open. Using a clean piece of rag and lysol solution, the pus, &c., is then cleaned away and the part washed. The wound must then be treated every two or three days till healed.

Between treatments the sheep should be placed in a well-grassed paddock.

Remember that the object of treatment is to clean away pus and dirt, and that cleanliness must be kept in mind throughout treatment.

Do not be in a hurry to open the prepuce of all sheep, but if they are not badly affected, try syringing first.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

By JAS. CAREW.

FAT-LAMB raising should form part of the routine farming in parts of Queensland, where the cultivation of a variety of fodder crops and grain can be carried on successfully. This industry has never been carried on in a general way in Queensland, and only a few Darling Downs farmers have continued it over lengthy periods. Where the correct breed and type were used, good lambs have been produced and sent forward, and some of the lambs shown at the Brisbane Exhibition were prime for export. That many lambs sold in our markets are not prime for export is, however, a well-known fact, but this can hardly be otherwise when such a large percentage of them are pure Merino. Should we wish to develop successfully this important section of the sheep industry, it will be necessary to give full consideration to breeding, feeding, and marketing. We must be influenced in the breed we select by the demand for the dressed lamb in our most important markets, as well as by the influence of our local conditions in producing them.

The Importance of the Dam.

The type of breeding ewe is important, and must be considered from several aspects. The ideal for the purpose is the large-framed, roomy ewe, productive in milk and wool, that will give a high percentage of lambs, and, if possible, mate at suitable seasons of the year. This type is difficult to obtain, with the result that a beginning must be made with the best that are offering.

As a mother for raising fat lambs, the pure-bred Merino cannot be regarded to be as satisfactory in a general way as crossbreds or comebacks. Merinos are more careless as mothers, giving a smaller milk supply; besides, they do not fit in so conveniently in mixed farming practice. They do, however, compensate somewhat for these disadvantages, in so much as they will mate successfully both in spring and

autumn. Ewes of the British Long-wool-Merino cross mate more successfully in the autumn, and as the best price is usually obtained for the lamb that is fit for slaughter in August, September, and early October, the Merino will secure this advantage; but it should be of the strong robust Western type. The value of the Merino covering must also be taken into account, while their condition remains more in keeping with requirements for breeding purposes.

The half-bred Downs Merino ewe will also mate successfully in the early summer, as well as in the autumn; and on this account is deserving of consideration, for a high percentage of lambs can usually be expected. Here, again, another disadvantage is introduced, for in good seasons the ewes not carrying lambs are inclined to develop too much condition, while at all times they do not carry a profitable fleece.

A Suitable Cross.

By crossing the Lincoln, Romney Marsh, English Leicester, or Border Leicester with the Merino, a most suitable type of ewe will be secured for autumn mating.

Preference may be given to the Romney Marsh cross for the lower and damper country, and to the Border Leicester cross for the higher or plateau areas like the Darling Downs.

These crosses produce a good lengthy fleece of wool, which usually meets with a good demand. They come to maturity fairly early, are good milk-producers, easily handled, and when mated to a quick-maturing breed of ram, the lamb should be sold off the teat, provided suitable food is available.

Export Trade Requirements.

To obtain best results for export lambs, evenness of type must be produced; and as the sires have the greater influence in this respect, we should choose that which is most likely to meet the demand. At the present time, the lamb most eagerly sought after is that weighing from 32 to 30 lb., and even lower.

To meet this demand the Downs types are the most likely to show plumpness at this weight, which they should reach in three months under favourable conditions. Although this is the size and type to secure top prices, other carcasses of the larger type do not fall away to any great extent at price per lb., such as the longer carcass of a Romney Marsh or Border Leicester cross, which should dress 38 lb. at four and a-half months. Should the season be unfavourable and lambs require to be kept over, the value of the covering they produce has an important bearing on the business. To get best results it is necessary that all growers produce an even type for export, and these should carry a special brand or tag to indicate standard excellence. Here is a suitable suggestion for a brand:—Darling Downs, Queensland, or DD over Q, to indicate the early plump prime light weight; and ED over Q to indicate the English long-wool influence in the heavyweight lambs. Lambs over 38 lb. dressed weight are not in keen demand for export; therefore, the seasons and provision for fattening are important factors in successful fat-lamb raising.

Even when breeding on proper lines, the only way to secure and place prime lambs on the market is to give them a good start off and keep them going with plenty of good and suitable food right up to the time they are trucked for slaughter.

Suitable Fodder Crops.

To secure best results, the pasture must be good, succulent, and plentiful.

This is seldom present for sufficient duration in our forest country pastures, therefore we must associate fat-lamb raising with agriculture, or adapt the slogan "The lamb must follow the plough."

Crops must be timed for use in the fattening of lambs, which in turn is governed by the mating period. Full consideration must be given to all influences likely to have a bearing on the position. The class of crop suitable to the soil and conditions and the time of year must be taken into account.

If lucerne can be grown successfully, it will be found the best for the main supply for most of the year. It gives best results when associated with grass pasture, adding some grain when finishing off.

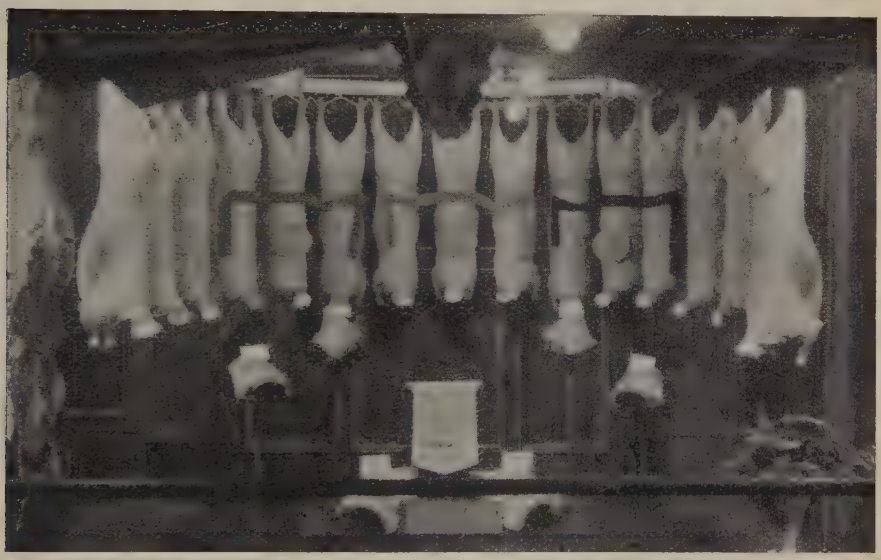

PLATE 240.—DISPLAY OF DARLING DOWNS LAMB CARCASES.

[Block by courtesy of Queensland Meat Industry Board.

Other crops suitable for given seasons are wheat, oats, barley, canary, rape, turnips, &c., for autumn sowing, and the panicums, millets, and Sudan grass for summer feeding and stacking.

When lambs are well fed and quickly fattened, they will be prime, plump, and sappy. In that condition they cannot be expected to stand up to hardship; therefore quick transport and immediate treatment at the works are two of the most important factors in avoiding serious loss of weight, and in maintaining the appearance of carcasses when dressed. If lambs on transport are to be man-handled, they should not be scruffed but lifted by securing a proper hold; any treatment likely to leave a bruise on the carcass should be avoided.

In obtaining the most satisfactory results, the co-operation of the Queensland Meat Industry Board and local agents is, no doubt, assured.

If numbers increase to anything near what Queensland is capable of producing, systematic forwarding will be necessary, and arrangements should be completed with the abattoirs before forwarding.

Preparation of Wool for Market.

TREATMENT OF BAGS AND BUTTS.

THE disposal of bags and butts is a problem that has always been in evidence, and even in the best of large clips the difficulty is encountered. Every broker at every sale has bags and butts which he wishes to sell to best advantage, and would be more satisfied without them. A duty to the client causes the broker to secure the highest possible price, but this is never likely to be in keeping with its true value, as the bags and butts are sought after by speculators only. As they are purchased for reclassing and reselling, it cannot be expected that their true value could be given, but rather that they be secured at the lowest possible price. Large owners are pleased to get rid of them with the least amount of trouble; therefore, when consigning their clip the bags and butts are included, except in cases where the odd lots are placed in bar bales. Bar bales are more objectionable to the broker than bags and butts; therefore, the difficulty is a real one. One of the most satisfactory methods would be to treat them on a large pooling floor where sufficient are put together to form bulk lines. This would be a distinct advantage to the small grower who does not grow sufficient wool to class it into bales, let alone bulk lines; while the large grower would also benefit. There is no question about the advantage of placing as much wool as possible on the market in bulk lines, and if not in bulk lines, then in bales. Bulk lines—five bales and over—are offered in the general catalogue and auctioned where all big buyers operate, while four bales and under are sold under star lot and competitive conditions, each system being distinct to the sale of bags and butts, which are really sold by barter.

In order to secure for all growers the best method of placing their wool on the market, the Department of Agriculture and Stock has so extended the conditions of the Farmers' Wool Scheme as to include—(*a*) wool from crossbred and British breeds from any holding; (*b*) bags and butts from any holding. This will allow that any grower may, with the consent of the owner, forward bags and butts for classification at the Departmental Wool Store.

With a view to securing an advantage for all wool-growers without causing an injustice to wool-brokers, it has been arranged that all brokers sell the wool from the scheme in turn. The drawing which the brokers themselves conducted recently resulted in the Queensland Primary Producers' Association, Limited, securing the agency for the season 1934-35. It now rests with the growers themselves as to whether they take advantage of the facilities that are placed at their disposal. The scheme is under the control of the Department of Agriculture and Stock, and the classing is carried out by qualified officers, while qualified accountants look after the bookkeeping part of the business.

Tuberculosis in Dairy Cattle and Pigs.

By J. C. J. MAUNDER, B.V.Sc.

THE influence of dairy cattle in the transmission of tuberculosis to pigs, resulting in partial and complete condemnations of carcases, is universally recognised. Much confusion seems to exist, however, concerning the relative importance of the various channels of infection.

The popular belief is undoubtedly that milk from infected cows fed to pigs is the most important source of infection. Actually, in conditions under which pig-raising is carried out in Queensland, milk infection is of minor importance compared to the degree of infection caused by ingestion of materials contaminated by dung of tuberculous cattle.

Consideration of the following facts will explain the relative importance of milk infection and infection from body excretions:—

It is well known that a cow with tuberculous lesions of the udder will excrete the organisms in the milk; in addition any tuberculous animal, though udder is healthy, is likely to intermittently excrete the bacillus in the milk. Personal observations obtained from tuberculin testing and post-morten examination of reactors has revealed the fact that the percentage of udder lesions is small, not exceeding 2 per cent. of tuberculous animals. Therefore, approximately 98 per cent. tuberculous animals merely excrete the organism in milk at irregular intervals, some infected animals never excreting the organism in the milk.

Before tuberculous infection becomes established in a pig repeated ingestion of infective material is necessary. Intermittent ingestion of organisms can usually be countered by the natural body defences, and possibly increases the resistance of the animal to the disease.

In considering the importance of excretion of the bacillus in the dung of tuberculous cattle, the following facts should be studied:—

(1) Infective sputum in cases of pulmonary tuberculosis is coughed up and swallowed by the beast, reaching the intestinal tract and being excreted in the dung, the organisms retaining their virulence.

(2) Bile of infected animals is often found to contain the bacillus, the source either being lesions of the liver or organisms in the blood stream eliminated through the liver and evacuated with the bile through the intestine.

(3) Intestinal and peritoneal lesions are responsible for the evacuation of bacilli in the dung.

When it is considered that the vast majority of cattle affected with tuberculosis have lesions in either lungs, lympathic glands, pleura, peritoneum, or liver, it will be realised that this group evacuating the bacillus in the dung must constitute a greater menace than the 2 per cent. of udder infections excreting the organisms in the milk. In addition to the presence of the tubercle bacillus in dung of affected animals the organism may be evacuated with the urine when lesions are present in kidney, pelvic lymphatic glands or genital organs.

Assuming then that dung of infected animals, or material contaminated with dung, and, to a lesser extent urine, constitutes a greater menace of tuberculous infection of pigs than the ingestion of milk from tuberculous animals, evidence is produced in support of the belief.

Investigation of properties from which pig condemnations have been heavy always reveals the fact that young pigs are allowed free access to areas soiled by droppings of dairy cattle.

One interesting case is quoted. A dairy farmer had for some years suffered heavy losses from pig condemnations. Assuming the source of infection was milk from tuberculous cows he decided to feed only thoroughly-boiled milk to his pigs. In the batches of pigs that had been fed only on boiled milk condemnations showed not the slightest diminution. Therefore, a definite source of infection existed apart from the milk supply. A survey of the herd was made, suspicious cattle destroyed, and methods adopted to ensure that young pigs were not allowed access to areas soiled by droppings from the dairy cattle. Milk was fed without boiling and the condemnations of these pigs were nil. This particular farmer has since adhered to the practice of enclosing of pigs with excellent results.

Another case is worthy of recording.

An owner conducted four farms, the cattle for the four farms being drawn from a common source. Careful periodical inspection and culling revealed that each herd contained from time to time tuberculous beasts. Hence, on each farm, there existed the danger that pigs would contract the infection. Actually, over a period of years, condemnations were always confined to one farm only, and investigation showed that this was the only farm on which pigs were allowed access to areas contaminated by droppings of dairy cattle. Examination of the cattle showed that the health of the cattle in the four herds was of an even standard.

It would appear, after consideration of the incidence of tuberculous lesions in various organs of dairy cattle and the means of excretion of the organisms, and field observations, that material contaminated by dung from tuberculous animals constitutes a greater menace to the health of pigs than does milk from infected cows.

In further consideration of the problem, the feeding habits of young pigs should be observed. Notice how the pigs roam around nosing under dried clumps of manure, seeking the small green shoots of grass and herbage. The tubercle bacillus present in the dung from affected cows has been existing under conditions ideal for the maintenance of its virulence, that is moisture and protection from light. There is, therefore, great danger of infection of scavenging pigs with virulent organisms.

When cattle have been fed on whole corn a proportion of the corn is passed out unchanged and forms a great attraction for the pigs. In picking out the grain from the manure there is great danger of infection with organisms excreted from a tuberculous beast. Young pigs having access to offal of animals slaughtered is also most undesirable, while the practice of slaughtering diseased cattle and feeding to the pigs is disastrous.

Methods of Dealing with the Problem of Condemnations in Pigs.

1. Where condemnations have been heavy over a long period, it is desirable to make a survey of the entire herd, selecting any suspicious beasts for the application of the tuberculin test. Selection of such beasts should be guided by the following clinical symptoms:—

(*a*) Deep distressing cough, sides heaving, tongue protruded.

(*b*) Difficult, snoring respiration.

(*c*) General delibity, staring coat, dull, sunken eye, the whole giving an impression of a sick animal, reluctant to move about.

(*d*) Enlarged lymphatic glands of head and neck, pre-scapular, pre-crural and mammary regions.

(*e*) Falling away in condition following calving.

(*f*) Large swellings in the udder, usually high up at the back.

(*g*) One or more quarters not functioning.

(*h*) Muco-purulent nasal discharge periodically expelled by violent snorting.

In addition to the above select the offspring of an animal known to have been tuberculous.

By the selection of cattle as outlined, submission to the tuberculin test, slaughter and burning of reactors the herd can be cleaned of animals most likely to have been the source of the trouble.

It is well known that cattle may be tuberculous to a considerable extent and exhibit no symptoms, and it is likely that such cattle would still remain in the herd after selection.

Infection from such cattle is effectively prevented by strict enclosure of young pigs from time of birth until marketed, thus preventing access to infective droppings and material contaminated by same.

2. Where it is not possible to have the tuberculin test applied, culling of animals exhibiting the symptoms outlined, and enclosure of pigs will yield good results. However, this method, i.e., dispersal with tuberculin test, is likely to result in culling of non-tuberculous animals.

3. Where condemnations are light, consisting chiefly of heads with only an occasional carcase, it will often be impossible to select any really suspicious beast that may be responsible. In such cases, excellent results are obtained by simply paying attention to the complete enclosure of the pigs.

4. Application of the tuberculin test to the entire herd with slaughter of reactors is the surest method of eliminating tuberculosis in the pigs. However, it is often impracticable to pursue this course on account of the severe economic loss that may be entailed. In addition some reacting animals with very light infection and not in any way responsible for transmission to pigs would be destroyed.

Occasionally the condemnation of carcases cannot be traced to the dairy cattle as the source of the tubercular infection. Under such circumstances the brood sows may be responsible, though actually such

is rarely the case. When brood sows are solely responsible for condemnations, it is not difficult to diagnose due to the fact that the sow will exhibit rather marked symptoms. Chief of these are swellings in the head and neck region, sometimes discharging; marked digestive disturbances leading to emaciation; short dry cough later becoming distressed with difficult breathing; swollen joints which may discharge cheesy purulent masses.

The mere fact that although sows are often suspected and slaughtered they are usually found to be healthy, rather supports the belief that the milk from the dairy herd is not responsible for tuberculosis of the young pigs. Should the milk be solely responsible for all the condemnations of pigs for tuberculosis, surely it is obvious that brood sows in piggeries suffering condemnations would, despite greater resistance due to age and repeated light infections that had been overcome, also contract the infection, and within a year or two the majority of brood sows would be suffering from advanced tuberculosis leading to occasional deaths.

One additional source of infection worthy of mention is the poultry.

Pigs are susceptible to the strain of the tubercle bacillus causing the disease in poultry, and it should be remembered that tuberculous poultry excreting in pig pens are capable of transmitting the infection to pigs.

Fortunately avian tuberculosis, as far as has been determined, is of rare occurrence in Queensland. Hence, this source of infection is not so important as in other countries.

Summary.

1. The source of practically all tuberculosis in pigs in Queensland is the dairy cow.

2. Infection of pigs takes place chiefly—

   (*a*) By ingestion of infective milk;

   (*b*) By ingestion of material contaminated by infective droppings.

3. Infection by ingestion of material contaminated by infective dung is of greatest importance under conditions of pig-raising usually practised in this State.

4. Attention to health of the cattle, and complete enclosure of pigs preventing danger of ingestion of contaminated material will result in the elimination of persistent condemnation of tubercular carcases.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Queensland Weeds.

By C. T. WHITE, Government Botanist.

KHAKI WEED (*Alternanthera repens.*).

PLATE 241.

Description.—A creeping perennial herb, rooting at the nodes, stems hairy. Leaves opposite in unequal pairs, the one being usually much larger than the other, averaging about 1 inch long and ¾ inch wide, broadly obovate (i.e., inversely egg-shaped) in outline, apex with a minute spicule, base tapering to a more or less slender leaf-stalk. Flowers borne in great abundance in numerous heads in the leaf-axils; each flower surrounded by sharply pointed bracts, the whole head ripening in seed into a spiny burr. Seeds enclosed in loose membranous, easily detached skin (pericarp), light-brown in colour, smooth, round and flat, about one-sixteenth of an inch in diameter.

Distribution.—A native of tropical and subtropical America, now a naturalised weed in many warm countries. It is one of the most troublesome weeds in Queensland. It is very abundant in South Africa, and is supposed to have been introduced there from the Argentine in fodder at the time of the Boer War. From South Africa it is thought to have come to Australia, but how it came here is not definitely known.

Botanical Name.—Alternanthera, referring to the fertile anthers in some species of the genus alternating with sterile ones (staminodia); *repens,* Latin meaning creeping.

Common Name.—Khaki Weed or Khaki Burr is the general name given to the weed both here and in South Africa. I have generally regarded the name to be derived from the prevailing colour of the plant, particularly when drying off. A South African writer says, however, that the popular name, at least in that country, is due to the plant's association with the Boer War.

Eradication.—In small areas Khaki Weed is best destroyed by hand-grubbing or chipping, but as it has the power of sending out roots from the joints, there is always the chance, unless the work is carried out in hot, dry weather, of the cut pieces growing again, so that the cut-up plants should be raked up and burnt. In 1918 an officer of the Department of Agriculture and Stock, Mr. F. B. Smith, B.Sc., Assistant Agricultural Chemist, visited Beaudesert to inquire into the destruction of Khaki Weed by chemical means, and reported that the weed was easily destroyed by common salt (butcher's salt, or any coarse, common waste salt) at the rate of 1–2 tons per acre. A weak arsenical solution containing 0·2 per cent. arsenic will aiso be found effective where the poisonous spray could be used. The value of salt as a weed destroyer lies in its property of absorbing moisture both from the soil and plant tissues, and so kills the plant by thirst; thus to prove effective, it should be applied in hot, dry weather.

Botanical References.—Alternanthera repens (L.) O. Kuntze. In a letter from the Director, Royal Botanic Gardens, Kew, England (Sir Arthur W. Hill) under date 10th July, 1934, the above is given as the correct name for the common Khaki Weed of Queensland, with the following as synonyms:—*Achyranthes repens,* Linn. Sp. Pl. 205; *Illecebrum achyrantha* Linn.; *Alternanthera achyrantha* R. Br.; *Alternanthera echinata* Smith.

Nutritive Value of Pastures.

By E. H. GURNEY, Agricultural Chemist.*

WHEN it is considered that the major portion of the world's animal products utilised by man is dependent upon pasture, the great value of scientific investigation dealing with all the factors concerned with the growth of pasture must be recognised.

The value of the practical application of information obtained from such investigations should then also be recognised.

Until the last few years the study of pasture, together with other animal foodstuffs, was directed to the determination of Starch Equivalents, or Calories, and the "protein ratio," but it is now known that, in addition to these factors, there are others which are necessary to successful animal growth.

It would appear that green pasture of good nutritional value is supplied with vitamins, but these few remarks are made more in connection with the proteid and mineral content of pastures growing under different conditions and at different stages of growth.

Mention may be made that the value and functions of the mineral matter contained in foodstuffs is now more fully understood, and it has been proved that a number of stock ailments are caused through some mineral deficiency or incorrect mineral proportions in the food consumed.

The fact that fairly young grass growth is more nutritious feed for stock than the older rank growth has always been accepted, and in older settled countries, where the method of laying down pastures, is followed to an extensive degree that this fact was not overlooked is evidenced by the common practice of making hay of the pastures before it reaches the rank matured stage.

GRASSLAND MANAGEMENT.

The modern system of grassland management, though it is stated to have its origin in Germany in 1899 (A. W. Greenhill Jour. Agri. Science Vol. 20), has only been followed in the British Empire during the last decade. The present intensive system of rotational grazing consists of feeding off young pasture continuously, which is produced by grazing paddocks in rotation.

It must be understood that system differs essentially from the method of turning stock into different paddocks for purpose of feeding off any excessive grass growth.

The method of rotational grazing, which will be mentioned again, cannot, of course, be applied to the large grazing areas of pastoral holdings of the western districts, but grass growth in small paddocks might be protected and these paddocks used as nursery paddocks.

For the purpose of making quick comparison, the composition of grasses is stated as percentage of the dry material contained in the grass and any percentages quoted will have been calculated upon "water

* In a broadcast address to farmers from Radio Station 4QG.

free material." Thus a pasture containing 75 per cent. moisture and 25 per cent. dry material in which is included 5 per cent. protein, this amount of protein in 100 per cent. of dry or "water free material" would be 20 per cent.

The relatively long spells of dry weather occurring through the year in our climate has a great influence upon the feed value of our pastures. Rain falling after a spell of dry weather causes a very rapid grass growth, particularly so under warm weather conditions. The young flush growth of uncultivated natural grasses in the large grazing areas is only eaten by stock to a more or less limited extent, and what is not grazed off very rapidly reaches maturity. The young grass has, in most cases, a high feed value, considered both from its protein and mineral content; the amount of these food constituents varying somewhat according to conditions under which the grass has grown. But in all cases the feed value of the young grass decreases as growth towards maturity proceeds, and when the grass has reached the roughage stage the feed value is generally of a very low order.

The following figures from analyses of samples of Mitchell grass at different stages of growth are quoted in illustration:—

Analysis of Water-free Material.

—	Crude Protein.	Crude Fibre.	Lime (CaO).	Phosphoric Acid (P_2O_5).	—
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
Mitchell Grass ..	18·8	27·6	1·09	0·507	Young and green, 12 in. long; seed ripe and falling; more or less roughage.
ditto ..	8·2	32·4	0·55	0·310	
ditto ..	2·3	36·3	0·56	0·066	

From these figures the very great difference in the nutritive value of the grass at different stages of growth is very apparent. It should be mentioned that the different grasses of the western country are supplemented in good seasons and on good country by herbage, some of which is of very good feed value.

In discussing the pasture of the southern coastal areas different conditions exist, for here it is possible to control, to a large extent, both the kind of grass growing and its nutritive value. The pasture of coastal districts is principally utilised by dairy stock.

EXPANSION OF DAIRYING.

The dairy industry is expanding and competition is such that it is necessary for dairy products to be obtained as economically—and continuously—as possible, and it is for this reason that pasture management is so extensively practised in countries where dairying is to any extent conducted. Very briefly stated, pasture management in the coastal districts may be said to consist of sowing suitable grasses for the laying down of a permanent pasture, or the renovation of an existing pasture, and where the pasture is established by either of the above-mentioned procedures. The next and most important step in pasture management is to feed off the pasture when in its most nutritious stage of growth, namely, when it is young and succulent. The feeding off of only young grass growth is managed by having the pasture subdivided into paddocks of about 2 to 3 acres, and grazing off these paddocks in rotation. Fertilizers are applied to these pastures.

The following figures show the increased nutritional value of pasture that has had fertilizer—ammonium sulphate and superphosphate—applied compared with similar adjacent unfertilized pasture:—

—	Crude Protein.	Crude Fibre.	Lime (CaO).	Phosphoric Acid. (P_2O_5).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Fertilized Pasture ..	17·6	25·9	0·593	0·586
Untreated Pasture ..	7·6	27·2	0·421	0·253

These figures show definitely the improved nutritional value of pasture gained through the application of fertilizers. The above samples were grown in paddocks at Caboolture, but similar improvement in pasture value has been obtained where correct fertilizer application and pasture management has taken place. It may be mentioned that the application of superphosphate increases closer growth in the pasture, whilst the ammonium sulphate particularly benefits grass growth.

The growth of legumes such as clover in grass pastures increases the feed value of such pastures, as the legumes generally are richer in both protein and minerals, being particularly rich in lime, but grasses grown under good conditions and grazed at best period of their growth contain usually somewhat more phosphoric acid than the legumes. It would appear from this that to obtain the best results a certain balance of clover and grass is necessary in pasture.

It is not necessary to give any further examples showing the great difference in the nutritive value of young and matured pasture. The following will illustrate the value of correct grass management, a sample of paspalum pasture obtained at time stock were put on it contained the following in the water-free material:—

	Per cent.
Crude Protein	21·1
Crude Fibre	26·3
Lime (CaO)	0·416
Phosphoric Acid (P_2O_5)	0·616

Sixty-four pounds of this green paspalum would supply 2·2 lb.. of digestible crude protein, which amount is sufficient for a cow yielding 25 lb. milk of 3·5 per cent. fat; whereas 67 lb. paspalum at a stage of growth frequently fed to cows require the addition of lucerne chaff or concentrates in order to supply the 2·2 lb. of protein required as mentioned. It is cheaper to supply protein in grass than to buy concentrates for that purpose.

It is possible with suitable grasses and correct management of the grasses to supply high-feeding value material, when other food material is lacking, either by grazing, the grass, or by using the surplus grass of flush growth, which has been stored as hay or ensilage.

NUTRIENTS IN STOCK FOODS.

In considering stock foods it is convenient to classify the different food nutrients, and a brief classification is as follows:—

Proteins are nitrogenous bodies contained in foods, and are used in the animal body for the purpose of building up the flesh and muscle

and for repairing what may be termed the waste of these organs which is continually taking place.

Carbohydrates, including such substances as sugars, starches, cellulose (fibre). These substances are used by the animal for the purpose of supplying heat and energy.

Fats and oils are also used for supplying heat and energy.

Mineral Matter.—Vitamins: The proteins, carbohydrates and fats are termed the organic matter, and the mineral matter (ash) is termed the inorganic matter of foods. It is in connection with the mineral matter of foods that a few remarks will be made.

Some sixty years ago an investigator named Voit and others pointed out the necessity of having supply of mineral matter in rations for animals, but the importance of this matter was not recognised until a few years back. It is interesting to note that disease in stock has been an important factor in directing attention to the necessity of having suitable amounts of mineral matter in stock foods.

The mineral matter of plants and animal life is composed of similar elements as calcium, sodium, potassium, magnesium, iron, phosphorus, sulphur, chlorine, iodine, and also traces of other elements.

It has been proved that these mineral elements are necessary for animal life, and, therefore, if normal healthy life is to be maintained these substances must be contained in the food.

In the past it was assumed that any apparently nutritious ration would supply mineral matter which was thought was only needed to build the skeleton of the body, but it is now known that all rations do not necessarily supply the required amount or correct proportion of the different mineral ingredients. Also, it is now known that mineral matter besides being necessary for bone formation is also necessary for blood and other fluids of the body, and the normal functioning of the organs of the body.

Taking the milk of an animal as being the best guide as to what are correct mineral requirements of the young growing animal, in the case of cow's milk it is found that about half of the total mineral matter of the milk is composed of calcium phosphate (lime phosphate). Again the greater portion of the bones is composed of phosphate of lime. Therefore, the food for the young growing animal requires to be well supplied with lime and phosphoric acid. The adult animal requires relatively less than the growing animal, but these mineral ingredients must still be in sufficient quantity for maintenance requirements.

Then, in addition, the adult lactating animal requires in the food sufficient lime and phosphoric acid to make good the loss of these minerals in the milk produced, particularly are these minerals necessary in ration of heavy milking cows.

From what has been said it will be noted that phosphoric acid and lime are the mineral ingredients required in the largest quantities by stock. This fact is of particular importance in this country as the soil of a considerable portion of our grazing areas, also of some of the cultivated soils, are deficient in phosphoric acid. In a previous talk the much higher lime and phosphoric acid content of young pasture growth than when pasture was more matured was mentioned.

In connection with the average lime and phosphoric acid content of a few common foodstuffs, the following are mentioned:—

	Lime (CaO). Per cent.	Phosphoric Acid (P_2O_5). Per cent.
Lucerne Hay	2·0	0·56
Paspalum Hay	0·5	0·38
Cowpea Hay	2·3	0·50
Green Sorghum	0·2	0·12
Bran	0·09	3·00
Pollard	0·08	2·10
Maize	0·02	0·70
Cotton Seed Meal	0·36	2·60
Linseed Meal	0·50	1·70
Coconut Cake	0·32	0·94

From these analyses it will be seen that bran and maize have a relatively low lime content, but bran and maize, cotton-seel meal, linseed meal, and coconut cake have a high phosphoric acid content. The legumes, lucerne and cowpea, have a high lime content, but the phosphoric acid content is not as high as in the bran, &c.

The green sorghum, in comparison with the other mentioned foodstuffs, has a low lime and phosphoric acid content.

Generally pasture contains more lime than phosphoric acid, and, as mentioned before, owing to a deficiency of phosphoric acid in soils, there is frequently a decided deficiency of phosphoric acid in the grasses grazed; and, therefore, giving lime only to the animals will not remedy troubles cause by phosphoric acid deficiency and, in fact, will only exaggerate such troubles.

The depraved taste exhibited at times by cattle in the chewing of bones, &c., is certainly an indication of the want of some mineral matter not supplied by the food, and generally it is insufficient phosphoric acid. Of the elements mentioned as being present in plants potassium is usually present in ample amounts for stock requirements, and so far as investigations have gone there would appear to be no evidence of iodine deficiency. The same may be said about iron and sulphur, though these ingredients administered to stock in small amounts prove beneficial to stock.

The sodium and chlorine are contained in plant growth, but in addition these elements are given to stock by means of common salt. Now, because animals require and must have a certain amount of salt for maintaining the digestive and other processes of the body, a somewhat common belief with some stock feeders is that if salt is given to stock that is all that is necessary to supply to correct any mineral deficiency in the food consumed by their stock.

From the few previous statements made it is apparent that salt will not supply the phosphoric acid deficiency frequently existing in our pastures.

The means available by which sufficient amounts of phosphoric acid may be supplied to stock are possibly well known, but are certainly not always practised.

Such means are (1) by cultivating and fertilizing pasture and then feeding this pasture off in the young stages of growth; (2) including in a ration some ingredients containing a fair amount of phosphoric acid; (3) by supplying stock with a good phosphatic lick, that is a lick containing a fair amount of phosphoric acid, and not an excessive amount of salt.

Some Requirements of Plant Growth.

By E. H. GURNEY, Agricultural Chemist.*

THE food of plants is naturally the first requirement to be considered in connection with plant growth.

Plants are composed of many compounds, these compounds being built up with chemical elements. The following elements are found in plants:—Carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, calcium, potassium, magnesium, iron, sodium, silicon, manganese. Other elements are found in plants, some of which are now also considered as possibly being essential to plant growth.

Water, in so far as quantity is concerned, is the most important factor in plant production. The amount of water which enters the roots of plants and transpired through the leaves during growth is enormous. The amount will be realised when it is stated that for every pound of dry material manufactured by plant processes, from 300 to 800 lb. of water have been required. Of course, this amount of water represents the water that has circulated continuously through the plant carrying fresh amounts of dissolved food from the soil to meet the needs of the growing plant. In different crops the water required to produce one pound of dry matter varies considerably, thus it is stated wheat requires 500 lb., oats 600 lb., and clover 800 lb. of water to produce 1 lb. of dry plant material. Though the amount of water in the plant at any one time is large compared with other material composing the plant, it is relatively small when compared with the amount of water transpired.

Briefly, we may consider the composition of some crop—paspalum, for example—Water, 75 per cent.; organic matter, 22 per cent.; ash, 3 per cent.

Now practically one-half of the organic matter of plants consists of carbon, the rest of the organic matter being composed mostly of oxygen and hydrogen, and a small amount of nitrogen—about 0·4 per cent. The plants by means of the green colouring matter—chlorophyll—in their leaves have the power in sunlight of assimilating the carbon contained in the carbonic acid of the air. The air contains on the average 0·033 per cent., or one hundred of 1 per cent. of carbonic acid gas, and it is certainly very wonderful that about one-half of the dry matter of all green plant growth and coal in the world is the result of the assimilation by chlorophyll mentioned above.

Essentials of Successful Plant Development.

With this brief review of plant composition consideration can be given to means that may be employed to enable plants to obtain the requirements necessary for their most successful growth.

Plant life is assisted in connection with carbon assimilation in being situated in locations which permit of their receiving suitable exposure to sunlight, and this is one of the reasons that certain situations are more suitable than others for some crops.

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*In a broadcast address to farmers from Radio Station 4QG.

Here it may be mentioned that iron is necessary in plant life as it controls the formation of chlorophyll, and in some cases a deficiency of iron has caused a plant trouble termed "chlorosis." There is usually an abundant supply of iron in most soils, but in some cases where plant chlorosis has occurred owing to iron deficiency, the trouble has been rectified by the application of iron sulphate, either as a spray or to the soil.

Regarding the water requirement of plants, means are available for assisting plant growth in this requirement, and the first measure to be undertaken is to prepare the soil as far as possible into a suitable condition for the reception and retaining of rain. Rain falling upon a soil with its surface in a hard crust-like condition will be unable to penetrate the soil to the extent it would if soil surface was in a friable condition.

Some soils are able to retain the rain falling upon them better than others, and this is due to the fact that soils are composed of variable amounts of different materials. These various soil ingredients have very different power of absorbing and retaining water, thus soils having a high humus content and clayey soils have a much greater capacity of absorbing and retaining water than sandy soils. It has been found that a more or less pure sandy soil will only retain about 25 per cent. of its weight of water, whilst a sand clay may absorb as much as 50 per cent., and a soil with high humus content may absorb 85 per cent. or more.

It is considered that the most successful plant growth is obtained when the water content of the soil ranges from 40 to 50 per cent. of the total water-holding capacity of the soil.

Therefore, plants may be assisted in obtaining their suitable water requirements, first, by improving the condition of soil by converting it into a more open and friable condition by cultivation and liming, and in the second place by increasing the humus content of the soil.

Humus can be added to the soil by the addition of farmyard manure and by ploughing in green manure crops and all vegetable residues. In our climate, with at times long spells of dry weather, the necessity of increasing the humus content of soils for the purpose of retaining the soil moisture as long as possible is gradually becoming recognised, though not to the extent that its importance deserves, but as farmyard manure is not available in large quantity, the ploughing in of green manure crops should be a regular procedure in our cultural system.

It was mentioned that the organic matter of the paspalum contained a certain amount of nitrogen; similarly all plant life contains nitrogen, the percentage of nitrogen being much higher in the younger stages of plant growth than in the matured plant. Some plants contain more nitrogen than others. Thus leguminous crops have a high nitrogen content, and what is of particular importance is that the nitrogen of these crops is derived from the air, and thus the growth of a leguminous crop does not lessen the soil's nitrogen content, but increases it. This valuable property of the legumes is due to the fact that the various leguminous crops have different bacteria growing in "symbiosis" with them (symbiosis means the living together of two organisms for their mutual benefit).

The bacteria enter the roots of the plant, which results in the formation of nodules upon the roots, after which the bacteria obtaining energy from plant material converts the nitrogen of the air in the soil into compounds suitable for assimilation by the plant. For this reason legumes are particularly suitable as green manure crops, although other crop growths are valuable for this purpose.

Value of Humus.

It may again be stated that it is considered that in Queensland one very important means of maintaining the fertility of agricultural fields or garden plots is by the continued application of material capable of forming humus. That this application of humus may not supply all the mineral plant-food requirements is admitted, but humus in the soil assists in rendering more quickly available to plants the mineral plant-food applied by means of fertilisers. That mineral plant-food material is required by plants is shown by the composition of plant growth previously mentioned and is represented by the ash.

For the most successful plant growth there are requirements besides a sufficiency of moisture and plant foods. Some crops, such as clover, peas, cherries, thrive on soils that are not of an acid nature, whereas other crops such as maize have been grown successfully on soils having at least some degree of acidity. Again the different types of soils are more suitable for different plant growth, sandy loams being more suitable for root development of some crops than soils of a more clayey nature.

That crops have not made successful growth does not necessarily mean that some plant food is wanting or is in too small quantities, though this is very frequently assumed, whereas the real reason of poor growth may be that the type of soil is not suitable for the crop sown in it, or that the soil requires proper drainage, or that the soil has not a suitable aspect for the crop in question.

Therefore, in conclusion, it may be said for all crop requirements it is necessary to have all soil conditions such as tilth, available plant food, and soil bacterial population in good condition to satisfy their requirements.

FERTILIZERS AND MANURES.

Crops obtain their mineral plant-food requirements from the soil water. Cultivated soils usually contain abundance of plant food for many successive crops, with the possible exception of three or four substances—viz., nitrogen, phosphoric acid, potash, and lime. These substances in a fertile soil are not only present, but supplies are present in a form sufficiently available for the crop's need, whereas an infertile soil may contain the abovementioned food materials in a form unavailable to crops. Fertilizers and manures are applied to the soil to provide a certain amount of these plant foods to crops.

Fertilizers, often spoken of as artificial fertilizers, is the name given to what may be termed manufactured materials used for the purpose of supplying plant food to crops, and the term manure is more used in reference to such material as farmyard manure, guanos, and bulky organic material, which manures, it may be mentioned, improve the physical and biological conditions of the soils as well as supplying plant food.

Soils become depleted of some portion of their plant food by incorrect systems of cultivation; the supply of some particular plant food is exhausted before others. What particular plant food is required to be supplemented with application of fertilizer can be determined by experimental plots with crop it is intended to grow. Different crops require varying proportions of the different plant foods, some requiring larger amounts of nitrogen, others demand more phosphoric acid or potash.

The general effect upon plant life of the different ingredients in fertilizers should be considered.

Nitrogen stimulates the growth of the stems and foliage of plants, and if excessive amounts of nitrogen are applied, particularly if a deficiency of phosphoric acid and potash exists, very vigorous plant growth occurs, but with poor development of flowers and fruit.

Phosphoric acid promotes the growth of roots, increases crop yields, and accelerates the ripening and maturity of crops.

Potash seems to be connected with the formation of starch and sugar in plants, and in some cases with increased crop yield. Potash deficiency causes plant growth to be less resistant to diseases.

Lime improves soil tilth, renders some unavailable soil plant food to become available, causes conditions favourable for bacterial growth, and neutralises soil acidity. As in most soils there is sufficient lime for plant food requirements, lime is applied for the purposes just mentioned and not for plant food.

All plants make use of the same plant foods, but different plants require different proportions of these food ingredients.

These plant foods ingredients are contained in different commercial fertilizers. Among what may be termed simple (that is containing only one food ingredient) nitrogenous fertilizers are nitrate of soda, containing 15 per cent. nitrogen, ammonium sulphate, with 21 per cent. nitrogen. Both of these fertilizers being water-soluble are quick acting, the ammonium sulphate being somewhat slower than nitrate of soda. It is considered that plants when taking up nitrogen from the soil water assimilate the greater portion of their nitrogen in the form of nitrates, and, therefore, that the nitrogen in the ammonium sulphate is changed by reactions in the soil to the nitrate form before being utilised by the plant. Dried blood is another nitrogenous manure containing from 11 to 12 per cent. nitrogen. The nitrogen in this fertilizer is not so quickly available as the nitrogen in the two previously-mentioned fertilizers, still dried blood may be classed as a fairly quick-acting fertilizer.

Two simple phosphatic fertilizers are superphosphate and Nauru phosphate. Superphosphate containing from 20 to 21 per cent. phosphoric acid in a water soluble form is a quick-acting fertilizer, whereas Nauru phosphate containing from 37 to 38 per cent. of phosphoric acid in a form insoluble in water, is a slow-acting fertilizer, particularly if it is not ground to a fine state of division. In fact results from the application of Nauru phosphate are frequently not noticed during the first year, but appear in the second year.

Potash is contained in the two fertilizers sulphate and muriate of potash. Both these fertilizers being soluble in water are very quick

acting. The sulphate contains 48 per cent. and the muriate 50 per cent. potash.

Bonedust contains two fertilizing ingredients—viz., from about 3 to 4 per cent. nitrogen, and from 20 to 25 per cent. phosphoric acid. Meatworks fertilizer also contains from 3 to 7 per cent. nitrogen and from 14 to 20 per cent. phosphoric acid, and as these fertilizers have to be first decomposed in the soil their nitrogen and phosphoric acid only slowly become available.

Mixed or complete fertilizers, of which there are many upon the market, are those fertilizers which are manufactured by mixing any two or more simple fertilizers together. These complete fertilizers are known and sold under trade names or number, or with formulæ such as 6-14-10, which means the fertilizer contains 6 per cent. nitrogen, 14 per cent. phosphoric acid, and 10 per cent. potash, and another example 0-14-8 means that such a fertilizer contains no nitrogen, 14 per cent. phosphoric acid, and 8 per cent. potash.

POINTS IN FERTILIZING PRACTICE.

In connection with the fertilizers previously mentioned, it was stated that some were "quick acting" others again were "slow acting" and this difference in the time taken before the fertilizing ingredient is in a condition suitable for absorption by the plant is of particular practical value. In the case of crops that occupy the ground for more or less long periods it is advisable to apply fertilizers in which the fertilizing ingredients gradually become available to the plants, or under some soil conditions it may be advisable to apply a fertilizer in which portion of the ingredients are quickly available and the other portion slowly available. For crops that come quickly to maturity quick-acting fertilizers are required in order that a plentiful supply of available food is provided. Again it is frequently required that at some particular stage of growth the crops are advantageously stimulated by some quick-acting fertilizing ingredient, and hence the practice of top-dressings. A very good example of the stimulating effect of a quick-acting fertilizer is seen in the modern practice of pasture cultivation, in which at first the pasture is fertilized with ammonium sulphate and superphosphate either without or with potash, then throughout the season topdressing with ammonium sulphate results in very definite increased grass growth.

Another point in connection with fertilizers is that some crops respond better to their application when their fertilizing ingredient is of organic nature and not mineral. In applying fertilizers to pineapples it is generally stated that it is preferable to apply the nitrogen required in the organic form—viz., in blood and meatworks manure (blood and bone) and not in nitrate of soda (the mineral form). The nature of the fertilizing ingredients in the complete fertilizers sold can always be ascertained as it is stated in what form they exist—thus nitrogen as blood or as ammonium sulphate—phosphoric acid as bone or as superphosphate.

Lime, as stated before, is usually used for the purpose of improving tilth, neutralising acidity, and liberating otherwise insoluble plant foods. Lime can be used in different forms—viz., as quick lime, agricultural lime, and pulverised limestone. Quick lime is recommended for use on stiff, heavy soils, whilst the use of pulverised limestone is preferable on

lighter sandy soils with low humus content. The pulverised limestone to be effective must be in a very fine state of division. The degree of fineness is of importance in connection with such fertilizers as bone, Nauru phosphate, &c., for the finer the state of division of such fertilizers the quicker do they become available to plants.

It must be distinctly recognised that success from the application of fertilizers cannot be obtained, if the soil to which they are applied is in any manner of bad condition, such as bad tilth, poor drainage, or poor bacterial condition. This last condition is of particular importance in connection with the effect of fertilizers.

Fertilizers are always more effective if applied in conjunction with farmyard manure, even if with only small amounts of farmyard manure, as such manure encourages bacterial activity which in turn assists in converting more quickly the fertilizers into an available form for plants.

In connection with manures, such as farmyard manures, green manure crops, and composted vegetable matter, it may be said that they are used particularly for supplying humus to the soil and thus improving the physical and biological conditions of the soil, but such manures depending upon particular soil condition and crop requirement, may or may not be able to supply the particular amount of any mineral plant food required.

In connection with farmyard manure, it is considered that its importance is not properly recognised, as by not being collected and ploughed into the soil or stacked, a very great waste of valuable material results. The composition of farmyard manure varies considerably, but 1 ton of mixed farmyard manure contains from 450 to 700 lb. of organic matter, 10 to 15 lb. of nitrogen, 3 to 6 lb. of phosphoric acid, and from 8 to 16 lb. of potash. Then neglect of composting waste vegetable matter also ensures the loss of very valuable material which is of particular use in orchards and market gardens. Regarding green manure crops, the composition of which varies very much according to the kind of crop used, but, besides a very large amount of organic matter which such crops return to the soil it must be remembered that the plant food material contained in such crops is in a very available condition. Of course it must not be overlooked that these plant foods, with the exception of the bulk of the organic matter, are taken from the soil and thus do not correspond to the actual addition of chemical manure, but, as previously stated, are of great value as they are in a very available form. Thus the amount of material returned to the soil by ploughing in a crop of cowpea from one acre was—Organic matter, 5,462 lb.; nitrogen, 216 lb.; phosphoric acid, 61 lb.; potash, 123 lb.

EFFICIENT RAT TRAP.

An effective rat trap can be made from a kerosene tin. Cut the top away, and have about 6 inches of water in the bottom. Float chaff on the surface of the water so that the rats do not see it, and on the chaff rest the bait—something rather strong, such as a piece of old meat. Lean a plank against the side of the tin so that the rats can climb up to the top of the tin. One drowned rat does not prevent others from jumping in. It is possible to catch quite a number of rats in this way.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PART IV.

THE TAMWORTH.

THE introduction of the Tamworth breed into Australia dates back to near the end of the last century. George T. Chirnside, of Werribee Park, Victoria, was among the earliest importers, and the writer well remembers the time when Tamworths were first introduced to Hawkesbury Agricultural College stud, Richmond, N.S.W., by the presentation by Mr. Chirnside to the College stud of a very fine pair, the progeny of imported parents.

Of these animals, the boar "Cholderton King, 2," was the better, and was the second pig registered in this breed in Australia. That fine boar, "Knowle Indian Prince" (imp.) (1), and N.B. 14587, was the first; it was from the stud of Robert Ibbotson, of Knowle, Warwickshire, England—the most successful breeder, I believe, of Tamworths in England in his day. The Cholderton pigs were from the stud of H. C. Stephens, another well-known British breeder. The first pigs registered in the Australian Herd Book were those from the Hawkesbury College, followed by a team bred at Dunwich Benevolent Asylum, Queensland, and the progeny of a pair presented to Dunwich (Dr. Row was Medical Superintendent at the time) by the Principal (H. W. Potts) of Hawkesbury. The writer had the pleasure of crating and despatching this pair when he was Pig and Bacon Expert at Hawkesbury.

There has been a considerable improvement in type and conformation since those days; although all along it has been essential to discard the short-bodied, thick-set, "Berky" type of Tamworth, since the longer-bodied, more fleshy type is necessary to maintain true Tamworth quality and fleshiness.

In those days the Tamworth pigs bred on the Manning River, N.S.W., were among the best in the Commonwealth; such well-known breeders as the Birds, Martins, Murrays, among many others, being prominent advocates of this old-world breed. There were very few Tamworths in Victoria at that time and practically none at all in the other States except Queensland, where the breed has been in favour for forty years or more.

The breed was accepted for registration in the Berkshire and Yorkshire Society Stud Books in 1914, and, with the change of name to the Australian Stud Pig Breeders' Society, were likewise accepted. They are sponsored by the National Pig Breeders' Association in England and have a world-wide distribution.

Early History of the Tamworth.

The sandy red colour of the Tamworth pig evidences its descent from the old English breed, while its peculiar properties show that in purity of breeding it is second to none. The earliest records of the Tamworths show them to have been a very active race, and of great fecundity. Their fame as producers of lean bacon is historical. Of all the improved breeds the Tamworth existed longer in its natural state, depending chiefly on itself for its food; and it is to this, probably, that is due its persistence of type, safeguarded so jealously by the early breeders and later by Herd Book representation.

PLATE 242.

Length, depth, and quality are the outstanding features of "Wattledale Top," a championship winner in the Tamworth classes at many Queensland shows. Owned and exhibited by Mr. J. Barkle, "Wattledale," Kingaroy.

A century ago when landowners, farmers, hotel-keepers, cottagers, and others in a position to do so fed their pigs and cured their own bacon—supplying less fortunate neighbours with the unrequired surplus—the Tamworth was undoubtedly one of the most favoured breeds, owing to its ability to produce carcasses with the finest long sides of bacon and big hams.

As time went on bacon factories were established, and pig feeders discovered that fat from their pigs could be sold at an equally remunerative price to lean. It was then that the Neapolitan and other breeds carrying more fat were imported. This action undoubtedly depreciated the percentage of lean meat from the consumer's point of view to such an extent that, like a swing of the pendulum, reaction of vigorous nature has shown itself in recent years, and the demand in England is now for lighter weight bacon with a preponderance of lean meat. This swing over to lean meat and to smaller joints has been experienced also in

Australia, where at one time the very fat pig was highly prized and priced.

American pork and bacon, noted for a larger proportion of fat, and which at one time realised the highest price of all, does not now occupy the same prominent position on British markets.

Improvement in Type.

The present-day Tamworth is certainly a much improved pig to that bred a hundred years ago, this being attributable to the careful attention paid to selection and breeding in later years. It must not be assumed that the improvement has been assisted in any way by the admixture of foreign blood, for this is not so; Tamworths as such have been kept absolutely pure. Undoubtedly, this is one of the many reasons why they hold the position of being one of the finest bacon pigs extant.

PLATE 243.

To be able to suckle and rear large litters of thrifty pigs is the brood sow's task in life. Such a sow as this has the capacity—she is "Glenburra Molly," from the stud of H. J. Keevers, a noted Richmond River breeder, New South Wales.

There is no doubt, also, that the Tamworth as one of England's oldest pure breeds, has justified its distinction as a breed eminently suitable for crossing where the object is to secure more quality, greater length of side, fine bone and higher percentage of lean meat. As stated, the Tamworth is descended from the old English forest pig without admixture of foreign blood; it therefore preserves the characteristic for leanness which has all along been a cardinal point in its favour. Wherever bacon pig classes (and in many instances pork pig classes also) and carcass competitions have been held, the Tamworth is represented by one cross or another. It has been truly said that there is no more popular cross than the Tamworth-Berkshire for production of bacon and pork in Australia, and in many other parts of the world.

The Tamworth possesses a naturally robust constitution, giving it an advantage in a country like Australia, especially under open air conditions and paddock feeding; for being by nature a grazing animal accustomed to live in the open, he is at his best when kept out of doors. The fact is that the Tamworth is not a good sty pig, his nature rebels

against sty-fed conditions; and he is less resistant to disease than when kept out of doors.

Tamworths Suit the Bacon Curer.

It has recently been computed by a number of leading bacon curers that a long, level-sided pig with fine shoulders, small jowl and back of moderate width, will produce as much as ten per cent. less of fat, and an accordingly increased ratio of lean meat. When it is borne in mind that fat is only worth half as much as lean, it will be appreciated readily how the Tamworth excels as a commercial proposition.

Consistent Prolificacy.

Tamworths are good farm pigs, hardy and prolific breeders, often producing 12 or 14 pigs at a litter (although 8 or 9 is closer to their average). The sows are good sucklers and docile with their young; if they are not, they should be immediately culled and be replaced by better sows.

PLATE 244.

"Glenburra Gem," a long-bodied Tamworth sow, with good middle piece, excellent hams, and a light forequarter such as is the objective in selection of breeding stock. She is a product of the Glenburra Stud, and was a prominent prize-winner at Royal National Show, Brisbane.

That Tamworths are long-lived as well as prolific has been proved by an old supporter of the breed in Staffordshire, who until recently had a sow that actually reared 168 pigs from 12 litters—an average of 14. The sow herself realised £17 after weaning her last litter. This is a record in prolificacy not often beaten by sows of the larger breeds.

While it is admitted there are breeds that produce more pigs per litter, the capacity to suckle and rear the progeny is an even more important factor and, generally, the Tamworth can be regarded as a reliable mother. To those who cannot afford to keep pure bred sows, the first cross sow, i.e., first cross between the Tamworth and Berkshire makes an ideal farmer's breeding sow, often superior in capacity to rear large litters to the pure bred.

For Crossing.

For crossing with other breeds the Tamworth can be strongly recommended, this, no doubt, being attributable to the fact that it is the oldest pure breed in England. Its type is, therefore, quite distinct and its prepotency unequalled. Owing to the length and depth of its sides and other characteristics of the baconer, the Tamworth is unexcelled for improving the flesh, fining the shoulders and reducing the jowls of many other breeds. The curer is always seeking to secure greater length of side and less fat in the pigs for his trade. The Tamworth is just the breed to cross with types that are shorter and deeper in body and with more plump compact hams. It is for this reason that the Tamworth has proved so popular as a cross with Berkshires and Middle Whites, which are more compact in body, carry a greater proportion of fat and have well developed hams. Crosses with types like the Large

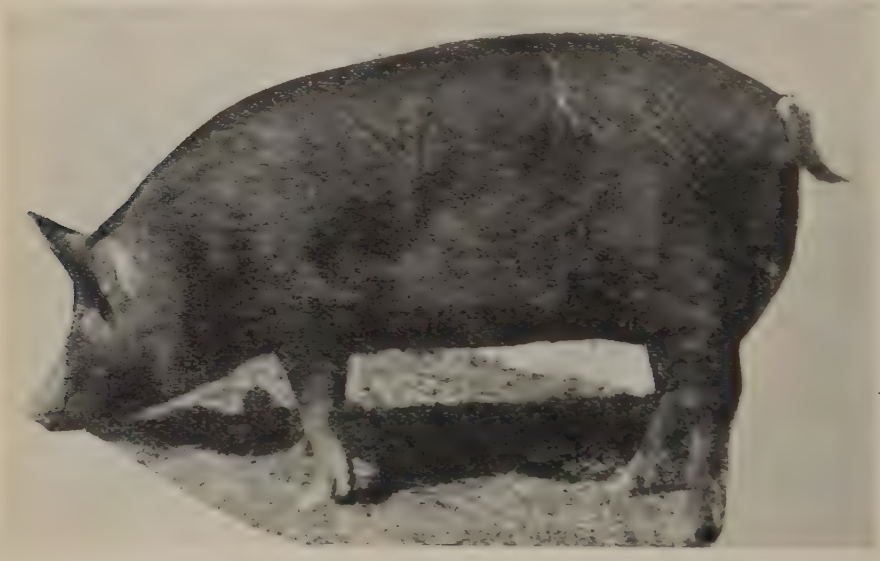

PLATE 245.

"Traveston Viola." Tamworth sow, bred by Mrs. A. Alford, of Traveston, owned and exhibited by G. W. Winch, Zillmere. A really good sow, that has since reared good litters, the photograph being taken when she was quite young after winning first prize at the Royal National Exhibition, Brisbane.

White are not recommended, for reason that both these breeds belong to the large framed class, and if crossed are productive of a type that is too tall and leggy and with insufficient substance, especially for the lighter weight class of pig required for Australian trade; such a cross would be ideal for a bacon pig weighing up to 200 lb. dressed weight—far above the maximum desired in this country. Similarly, it is unwise to expect ideal porkers or baconers when Tamworths are crossed with large type cross-bred sows. The type represented by the Tamworth-Berkshire first cross permits of the progeny being prepared either for the porker or baconer trade, with a decided preference for medium weight pigs in either class.

Colour of the Tamworth.

In a review of the breed in the Jubilee issue (1934-35) of the Pig Breeders' Annual, Mr. J. A. Frost quotes many interesting references to the capacity of the Tamworth to adapt itself to ordinary farm conditions. He states it is the only red-haired breed of pig in Britain, and in that sense is regarded as not only hardy but persistent. The original golden or chestnut colour is said to have been fixed by the foundation sire, a jungle pig imported from India by Sir Francis Lawley, of Middleton Hall, Tamworth, England, about 1800. The Middleton herd played a very prominent part in the breed's early history. After being used on different farms this original jungle pig seems to have had a long and strenuous life and to have stamped his offspring with his own red colour, thereby fixing a distinctive characteristic of a breed which

PLATE 246.

Tamworth Boar of the most approved type. "Berkswell Up-to-date," bred and exhibited by Colonel C. J. H. Wheatley, Berkswell, Warwickshire, England. Illustrated in "Pig Breeders' Annual," published by National Pig Breeders' Association, London.

was to become famous throughout the world. So famous, in fact, that on the dispersal of Robert Ibbotson's herd in 1924, his champion sow "Knowle Favourite" realised the record price of 200 guineas, the buyer being Major J. A. Morrison, a prominent herd master whose pigs have had a wide distribution. The same purchaser paid 150 guineas to secure a boar, "Knowle Newcastle," a noted prize-winner. At Mr. Ibbotson's sale the average for 24 sows and in-pig gilts was £47 3s. 9d.; the general average, including small pigs, being £30 6s. Another celebrated herd was that owned by Mr. Egbert de Hamel, Middleton Hall, Tamworth; Mr. C. L. Coxon secured his earliest stud animals from this herd. Theo. A. Stephens, who edited "Farming" for a number of years and later published the popular "Pigs Journal," was well known to numerous Australians. Mr. H. C. Stephens, of Cholderton Lodge, referred to earlier in this report, was also a very successful breeder.

At present, the largest and by far the most important Tamworth herd in England is owned by Colonel C. J. H. Wheatley, at Berkswell Hall, Coventry, from whose stud the parents of the champion sow at

Brisbane Exhibition, 1934, was imported by Mr. Bartram, of Victoria. Colonel Wheatley has a model piggery, a grand collection of sows and boars, and has been a very prominent prize-winner and importer at all British shows. There is a host of other breeders in England, but, strangely enough, the Tamworth has lost ground in recent years and is to-day not by any means a popular breed there, if one may judge by the very limited number of animals registered each year in the British Isles. In fact, more Tamworths are now registered in Australia every year than in Great Britain. This very fact should give breeders of Tamworths in Australia an excellent opportunity, for, with a shortage in England and a world-wide demand, it behoves Australian breeders to advertise extensively and bring before the world the wonderful quality and improved type of Tamworth pigs as bred here. It can justly be claimed that we now have in Australia, and in Queensland in particular, Tamworths equal in quality to the imported stock: thanks to imported parents plus care in breeding, feeding, and handling.

PLATE 247.

Group of prize-winning Tamworth sows, Royal Easter Show, Sydney. Owned and exhibited by Mr. F. S. Ebbern, Kelso, New South Wales.

The Tamworth breed owes much of its success in this country to the New South Wales Department of Agriculture, to the Hawkesbury Agricultural College, and, in more recent years, to the imported animals selected in England by Mr. Andy F. Gray, Senior Piggery Instructor in the New South Wales Agricultural Department, whose constant advocacy of the Tamworth-Berkshire cross has borne good fruit, and has assisted considerably in maintaining for the Tamworth its place among breeds of pigs in Australia.

Queensland breeders of Tamworths represented at the 1934 Royal National Exhibition, include Messrs. Jas. Barkle of the Wattledale Stud, Kingaroy; Bowman & Sons, Kin Kin; P. V. Campbell, Lawn Hill, Lamington; W. S. Hendry, Ascot Vale, Clifton; H. B. Kerner, Warwick Road, Ipswich; E. L. Melville, Caboonbah; M. Moffatt, Billinudgel, New South Wales; H. H. Seliars, Tabooba; Wide Bay Stud Piggery, Gympie; and G. W. Winch, Church Road, Zillmere. Many of the animals trace back to the Traveston Herd owned by Mrs. A. Alford. Mr. Lloyd Skerman, of Waverley, Kaimkillenbun, is another successful junior breeder and exhibitor.

Following is the standard of Excellence adopted by the Australian Stud Pig Breeders' Society:—

STANDARD OF EXCELLENCE FOR TAMWORTHS.

	Points.
Head and Ears.—Head fairly long; snout moderately long and quite straight; face slightly dished, wide between ears; ears rather large, with fine fringe carried rigid and inclined slightly forward	15
Neck and Shoulders.—Fairly long and muscular, especially in boar; chest wide and deep; shoulders fine, slanting, and well set	10
Back and Sides.—Back long and straight, with loin strong and broad; sides deep; ribs well sprung, and extending well up to flank; belly deep, with straight underline; and in sows, twelve good, evenly placed teats ..	20
Hams.—Broad, full, well let down to hocks; tail well set up and well tasselled	20
Legs and Feet.—Legs strong and shapely, with plenty of bone, set well outside the body; pasterns strong and sloping; feet strong and of fair size	15
Colour, Skin, and Hair.—Golden red hair on a flesh-coloured skin, free from black; skin fine and free from wrinkles; hair abundant, long, straight, and fine	10
Character.—A combination of all the points showing distinctive breeding, type, and quality	10
	100

PLATE 248.

RESERVE CHAMPION LARGE WHITE SOW.—"Gatton Vera." Exhibited by Gatton College.

Cucumber Growing

Supplied by the Fruit Branch.

THE warmth of the climate makes this crop a very suitable one for this State. In the coastal and northern districts several crops can be grown during the season.

Planting is usually done in the southern, coastal, and inland districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet on "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply in addition the following artificial fertilizer:—

1½ cwt. sulphate of ammonia or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixed fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was always sown on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about 1 inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly full grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes, Imperial White Spine; for pickling, Early Green Cluster.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

Standardised Judging of Fruit.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THE aim of all fruit exhibitions should be the improvement and advancement of the fruit industry. The achievement of this can be advanced by close attention to the production of better-quality fruit and the use of better marketing methods. The exhibition of fruit at shows is of appreciable assistance in permitting comparisons to be made of different growing methods, and their ultimate result in quality and colour. The progress of various packing methods may also be examined per medium of the show bench.

To obtain the most helpful results from the fruit displayed, only one system of comparison for judging can be used—namely, the points system of making awards. The use of this system places the judge in the position of helping the exhibitor, the particular advantages of any exhibit being definitely compared. Judges using a comparison not embracing a definite points system lose this advantage to the exhibitor, often resulting in dissatisfaction. The allotment of points can be left to the judge, a variation of the number allowed to each section being made at the discretion of the judge according to the particular section of the exhibition.

The following tables of points are suggested as a good basis to work on. This table may be varied to suit the various classes of exhibits, a basis of 100 points being allotted to each exhibit. As an example, where fruit is displayed in a section for fruit only, the whole 100 points would be allotted for the fruit; but where it is a case or tray section the 100 points would be split into two sections, 60 points for the fruit and 40 points for packing, &c., totalling 100 points. An examination of tables given for "Fruit Packing Classes" and for "Specified Classes" will serve as a basis of comparison:—

POINTS GIVEN WHEN JUDGING FRUIT PACKING CLASSES.

	Points.
Fruit—	
Type	15
Colour	10
Freedom from Imperfections	15
Quality	10
Maturity	10
Packing—	
Alignment	10
Height	10
Sizing	10
Compactness	10
Total	100

POINTS GIVEN WHEN JUDGING SPECIFIED CLASSES, SUCH AS FOR EXPORT, COOKING, OR DESSERT:

	Points.
Fruit—	
Commercial Value	5
Suitability	5
Type	5
Colour	10
Freedom from Disease, Imperfections, &c.	15
Quality	10
Maturity	10
Packing—	
Height	10
Alignment	5
Sizing	5
Compactness	10
Wrapping	5
Get-up	5
Total	100

These tables may be adapted to all fruit. An explanation of the various headings used should be of assistance:—

Type: Shape; natural size for the variety; with citrus absence of pips according to variety, size of navel if any, texture of skin.

Colour: Colour of fruit at maturity.

Quality: With citrus, thickness of rind, amount of rag inside, juice content, coarseness of cells; other fruits, texture of flesh, juice content, colour of flesh, and flavour.

Maturity: Size and colour of pips; colour of skin and flesh; flavour; acid content in citrus.

Freedom from Imperfections: Freedom from skin blemishes, spray damage, and disease or insect infestation.

Commercial Value: Suitability of the variety commercially for the particular class of entry; i.e., export class, variety Granny Smith apples would have a higher commercial export value than Pomme de Neige or Farmuese.

Suitability: Export classes, this would embrace size, variety, and ripeness.

LIME WATER FOR CALVES.

Besides being a necessary mineral constituent for all classes of animals, lime acts also in correcting acidity in the stomach. It also renders the curd portion of milk more readily digestible, particularly by young calves.

Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say, 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

Marketing Notes.

By JAS. H. GREGORY, Instructor in Fruit Packing.

Tomatoes.

INSPECTIONS in the Brisbane markets reveal that growers have not profited by marketing results of past seasons in respect of green tomatoes. Many consignments of tomatoes have cases containing from green to ripe fruit; from the marketing point of view this is unsatisfactory to buyers. Growers would find that an effort at colour grading, in conjunction with good packing, would be well repaid. Close attention should also be paid to interstate consignments, care being taken to eliminate all immature fruit. Immature fruit early in the season has a depressing effect upon the market from which it takes a lot to make it recover.

Papaws.

During the winter papaws have been sent successfully to the Southern markets in a more advanced stage of ripeness (i.e., firm coloured) than in previous years. While this practice is correct for the cooler months, care must be taken now that the hot weather is approaching to select fruit in a less advanced state of maturity. This applies particularly to Melbourne consignments, which have a much further and hotter journey than Sydney consignments.

Citrus.

The Queensland citrus season is now drawing to a close, but marketing conditions remain the same. Regularity of consignments is the only method of obtaining the best from the present unsatisfactory state of the market. Small fruit should, as far as possible, be kept off the market. Growers, by rotating their picking and carefully selecting the largest fruit at each picking, will considerably increase their yield and quality, thereby enhancing the tone of the market and getting better prices.

Stone Fruits.

Now that the stone-fruit season is upon us growers should become acquainted with the marketing regulations. Grade standards for the stone fruits must be carefully adhered to. Close attention to packing-shed cleanliness should be observed if the dreaded brown rot is to be kept within bounds. All reject fruit should be carefully destroyed and not left in cases or picking boxes in the shed. This will also help in keeping fruit-fly within bounds. Growers will find that close attention to sizing all fruits will be amply repaid.

CARE OF THE SEPARATOR.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to reinfect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

By H. W. BALL, Assistant Experimentalist.

THE rainfall for the months of August and September was generally under average throughout Queensland, so that seasonal crops were affected and natural feed reserves were becoming depleted by the time the welcome change occurred during the second week of October. The recent excellent rains throughout the farming areas will expedite the sowing of cotton, maize, tobacco, peanuts, and summer fodder crops.

Wheat.

Harvesting is now in full swing, and, providing no damaging storms or heavy rains are experienced during this important period, an average crop of good quality wheat should be garnered. Prospects appear particularly good in the Pittsworth district, where farmers benefited by conserving much of the heavy rain of the previous summer. It is the late-sown areas that will give the lightest return, indicating that the importance of thorough cultivation during a reasonably long fallow period cannot be too strongly emphasised. Excellent crops are also reported from the Dalby district, notably on the Jimbour plain.

Considerable expansion of the wheat and dairying industries is taking place in the Dalby area on lands previously devoted to sheep-raising.

In the Clifton, Allora, and Warwick districts the returns will be under average, partly because of lands being withheld from cultivation owing to the wild oat pest. These areas have been cropped to wheat for over fifty years, and the need for a long fallow period, to assist in reducing weed pests, is now apparent. Very little wheat will be harvested in the Maranoa this year, owing to the dry conditions experienced, and also to an attack by grasshoppers shortly after the plants appeared above ground. Isolated farms will yield good crops, notably in the Wallumbilla area, where the sandy loam soils favour the retention of moisture, so important in a comparatively dry area. Wheat is a precarious crop, and the grower knows from experience that he is never sure of his return until the grain is in the bag, so that a yield forecast can only be approximate.

PLATE 249.—A FINE PADDOCK OF PUSA WHEAT NEAR YANGAN.
" . . . a-keepin' of my feet,
While I cater for the nation with my wheat, wheat, wheat."

Tobacco.

Considerable attention will again be devoted to tobacco experimental work, the season's programme including variety, rotational, fertilizer, and green manurial trials, together with seed propagation plots in selected pure-seed areas. The planting of seed beds will now be proceeding, and growers are strongly advised to spray in accordance with departmental recommendations. Blue mould and leaf miner have been reported from seed beds sown during August and early October, where such spraying was not carried out. Such beds are a menace to those

PLATE 250.—ANOTHER FINE STAND OF PUSA NEAR WESTBROOK.
" Of the world's great work he has done his share who has garnered a crop of wheat."

established later on, and point to the need for a definite break of at least three months from the time the residue of one crop is destroyed, until the seed of the succeeding crop is sown.

PLATE 251.—A FIELD OF CLARENDON WHEAT NEAR TANNYMOREL.
"Sowin' things an' growin' things, an' watchin' of 'em grow."

Sugar.

Increasing temperatures have accelerated the growth of cane in the far North, and welcome falls of rain of upwards of 2 inches were recorded in the Mackay and Bundaberg districts in the latter half of the

PLATE 252.—ANOTHER GOOD CROP OF CLARENDON NEAR WESTBROOK.
" . . . From God's earth His gift of wheat."

month. This has considerably improved the outlook, although subsequent drying winds have nullified the benefits to some extent in the Bundaberg district.

PLATE 253.—ANOTHER FINE STAND OF CLARENDON ON CANNING DOWNS.

"Oh, I am the grass that has conquered man,
I am the King that is Bread!
Your armies and fleets are but fragile things
That await a nod of my head."

Crushing has been completed at Babinda and Mossman, where tonnages greatly below those of last year were crushed. Crops continue to cut above estimates in the Central and Southern districts, but owing

PLATE 254.—A FAMILIAR SIGHT ON THE DARLING DOWNS DURING THE WHEAT HARVEST.

"Then I come up bright an' grinnin' with the knowledge that I'm winnin'
With the rhythm of my harvester an' wheat, wheat, wheat."

to the lower tonnages in the North it is anticipated that the amount of sugar in No. 1 Pool will be somewhat less than was the case last year.

Flax.

Assistance has been granted through the Rural Assistance Board to a Flax and Linseed Company operating in Queensland. A large home market awaits the linseed grower, but hitherto there has been no demand for the flax fibre owing to the lack of manufacturing interest. Experience with this crop in Queensland is too limited to state definitely its possibilities, but the wise policy of encouraging the development of any promising sideline is being pursued.

General.

Large areas are being sown to maize, sorghums, sudan grass, and millets for fodder purposes. The preparation of land was held up considerably by the previous dry spell, but farmers are now losing no time in taking advantage of the altered conditions. Early potatoes have brought very remunerative prices, up to £20 per ton having been received. Reports indicate that the canary seed crop will be below average, owing to considerable areas being utilised for fodder purposes.

PLATE 255.—A CABBAGE FROM ST. LUCIA.

At St. Lucia Farm School vegetable gardening is an important part of the curriculum. This specimen was one of a large number of heavyweights. It tipped the beam at 18 lb.

Brisbane Show Champions, 1934.

PLATE 256.
Champion Polled Hereford Cow, "Lovely II." (S. A. Plant).

PLATE 257.
Champion Friesian Bull, "Tent Hill Starlight Actuary" (W. H. Grams).

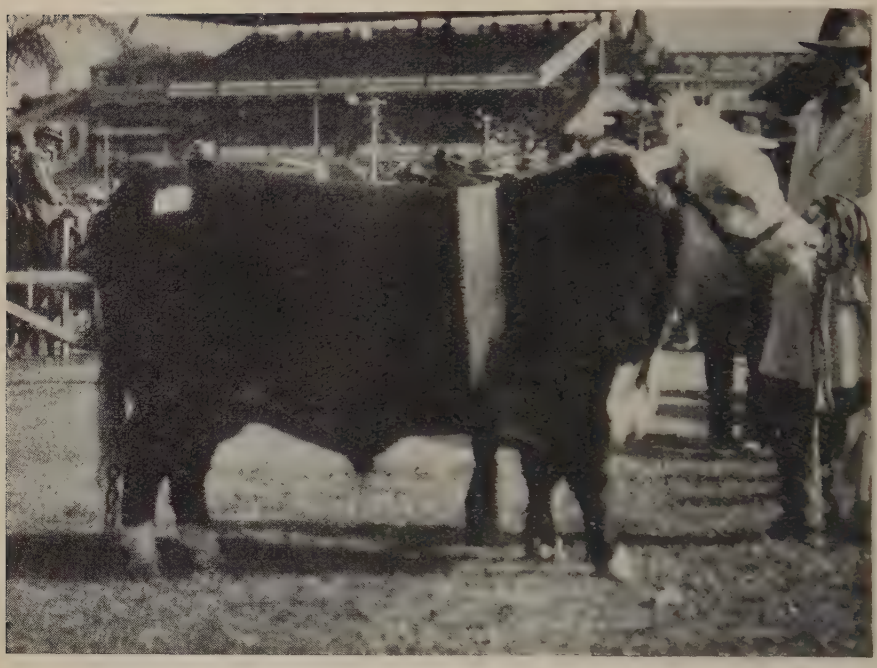

PLATE 258.
Champion Hereford Bull, "Me Mel Chieftain" (C. S. Rowntree).

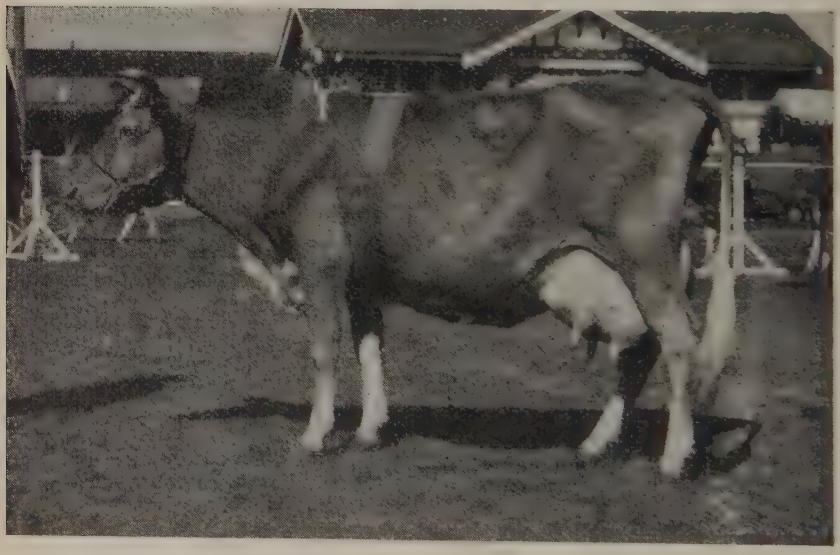

PLATE 259.
Champion Guernsey Cow, "Carramana Dolly" (A. E. Gillespie).

Plate 260.
Champion Jersey Bull, "Trinity Darby" (W. W. Mallett).

Plate 261.
Champion Ayrshire Bull, "Longlands Bosca" (T. E. Holmes).

PLATE 262.
Champion Polled Hereford Bull, "Trevanna King" (S. A. Plant).

PLATE 263.
Champion A.I.S. Bull, "Patrol of Cosy Camp" (Paul Moore).

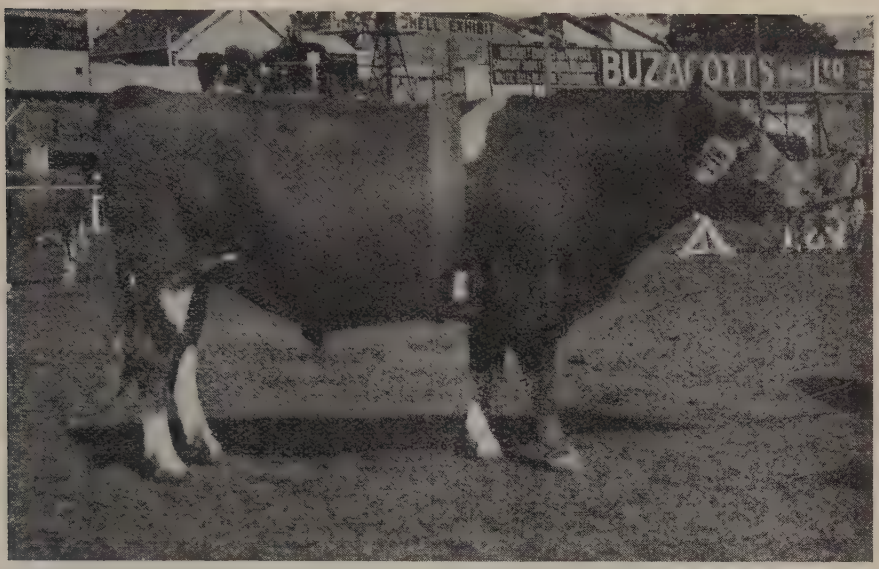

PLATE 264.
Champion Guernsey Bull at the Brisbane Show, "Spurfield Rocket," owned by A. E. Gillespie, Tanto, Springbrook.

PLATE 265.
Champion Beef Shorthorn Cow at the Brisbane Show, "Netherby Snow Queen," owned by J. T. Scrymgeour, of Netherby, near Warwick.

PLATE 266.
Champion Hereford Heifer at the Brisbane Show, "Ennisview Cherry Ripe IV."
(E. R. Reynolds).

PLATE 267.
Champion A.A. Cow at the Brisbane Show, "Bald Blair Twinkle IV."
(F. J. White and Son).

PLATE 268.
Champion Shorthorn Bull, "Netherby Royal Challenge" (J. T. Scrymgeour).

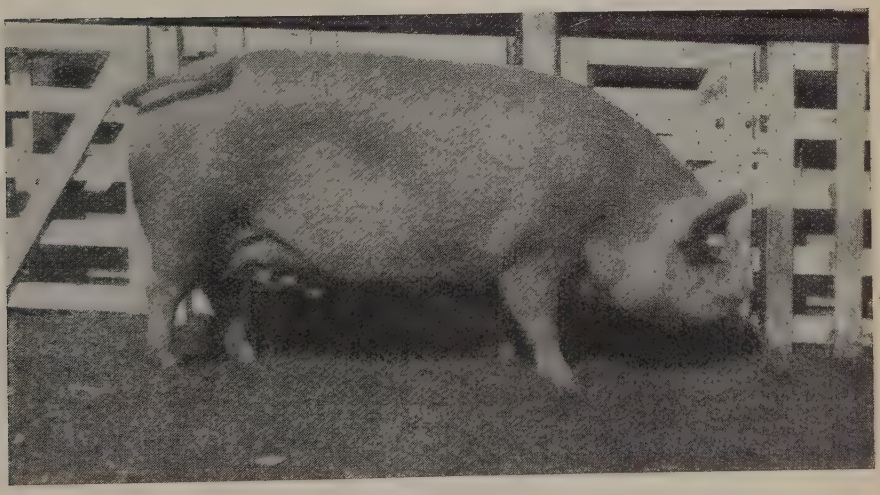

PLATE 269.
CHAMPION LARGE WHITE SOW.—"Pine Terrace Pear" (imp.). Exhibited by J. A. Heading, Murgon.

PLATE 270.

CHAMPION LARGE WHITE BOAR.—"Norfolk King David 5th." Exhibited by the Queensland Agricultural College and High School.

PLATE 271.

CHAMPION MIDDLE WHITE SOW.—"Norfolk Poppy 3rd." Exhibited by J. J. Slack, Dinmore.

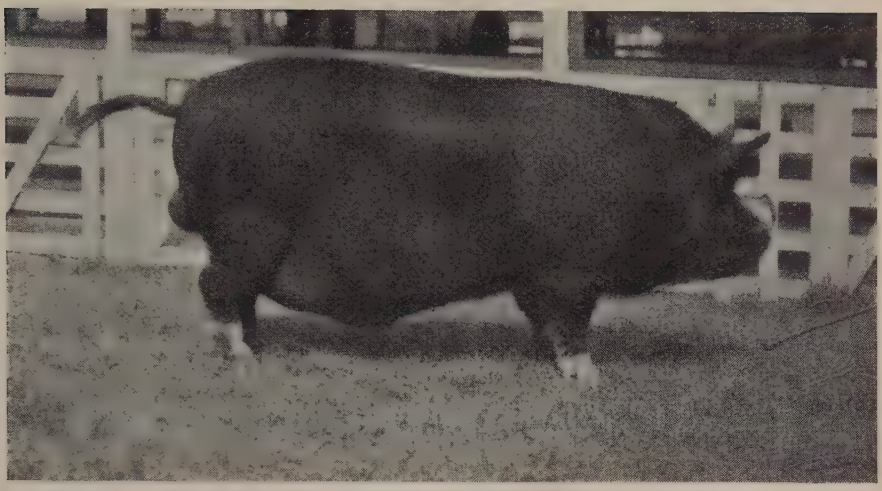

PLATE 272.

"Grafton Trump," who carries English blood, has proved himself an excellent stock getter and prize winner; among his winnings is the boar and progeny prize at the Brisbane Exhibition, 1934. Exhibited by Messrs. Mat. Porter and Sons, Wondai.

PLATE 273.

CHAMPION TAMWORTH SOW.—"Warringal Precocious," imp. in dam. Exhibited by J. Barkle and Son, Kingaroy, at the Brisbane Show.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Red Poll Cattle Society, and the Friesian Cattle Club, production charts for which were compiled for the month of August, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (over 5 Years), Standard 350 lb.				
Gem IV. of Oakvilla	H. Marquardt, Wondai	11,293·62	456·677	Victory of Greyleigh
Pansy 4th of Oakvilla	H. Marquardt, Wondai	11,716·91	444·99	Victorious of Oakvilla
Princess II. of Headlands	J. A. Heading, Cloyna	13,215·69	424·681	Major of Rosemount
Ashdale Red Duchess	A. Frank, Boonah	9,363·9	423·176	First Warrior of the Cedars
Molly of Mount View	V. Dunstan, Wolvi	9,551·65	382·498	Charming Lad of Hillview
Darling of Salt Bush Park	R. Ray, Yargullen	9,684·0	359·727	Hero of Strathdu
Senior, 4 Years (over 4½ Years), Standard 330 lb.				
Duchess of Kalinga	J. A Heading, Cloyna	10,480·71	418·915	Duchess Jellicoe of Fairfield
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Green Ridge Primrose 7th	E. W. Lawley, Maleny	8,601·7	338·435	Perfection of Arley
Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Morden Sparkle (365 days)	R. Mears, Toogoolawah	16,239·8	659·276	George of Nestles
Springleigh Tulip (258 days)	Moller Brothers, Boonah	8,207·05	329·643	Red Knight of the Cedars
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Blacklands Red Plum 6th	M. C. and A. M. Sullivan, Pittsworth	9,928·47	324·47	Hugo of Blacklands
Kilbirnie Bella 17th	Macfarlane Bros., Radford	7,476·15	309·316	Kilbirnie Guardsman
Jess IV. of Blacklands (258 days)	A. M. Johnson, Gracemere	7,677·2	309·107	Hugo of Blacklands
Beaudetta 3rd of Springleigh	Moller Bros., Boonah	8,217·6	300·220	Red Knight of the Cedars
College Ettie 3rd	Queensland Agricultural High School and College, Gatton	6,930·85	299·446	Fussy's Kitchener of Hillview

Senior 2 Years (over 2½ Years), Standard 250 lb.—*continued.*				
Rosalind II. of Headlands	J. A. Heading, Cloyna	6,959·59	278·806	Headlands Red Plum
Lucy VII. of Blacklands (257 days)	A. M. Johnson, Gracemere	6,141·45	270·206	Orama of Blacklands
Blacklands Fancy 5th	M. C. and A. M. Sullivan, Pittsworth	7,768·55	268·792	Major of Blacklands
Junior, 2 Years (under 2½ Years), Standard 230 lb.				
Claredale Dainty	J. E. Smith, Brookstead	8,610·7	358·954	Wilga Vale Masterpiece
College Queenie 2nd	Queensland Agricultural High School and College, Gatton	7,779·2	322·707	Duplex of Greyleigh
Heather of Glengarry	Geo. Waugh, Peeramon	7,227·3	312·605	Jean 7th Prince of Blacklands
Highfield Pink II.	J. A. Heading, Cloyna	8,502·94	306·639	Banker II. of Greenslopes
College Beryl	Queensland Agricultural High School and College, Gatton	6,829·03	286·127	Fussy's Kitchener of Hillview
Mabreen Rosebud	V. Dunstan, Wolvi	7,063·3	285·781	Numbawarra Headlight
Brundah Elfin II.	Mrs. K. Henry, Greenmount	7,417·71	277·959	Enchanter of Carawarra
Rosemount Melba 12th	P. D. Feichtner, junr., Hirstvale Road	7,174·36	272·553	Bright Star of Cosey Camp
Highfield Princess II.	J. A. Heading, Murgon	6,922·82	269·492	Gloaming of Hill Top
Kingsdale Dulcie 14th	A. A. King, Mooloolah	6,214·15	264·85	Express of Burradale
Sadie of Glengarry	Geo. Waugh, Peeramon	6,125·05	258·223	Jean 7th Prince of Blacklands
Lavender 18th of Quarnlea	Lehfeldt Bros., Kalapa	6,478·37	247·571	Colonel of Quarnlea
College Rachel	Queensland Agricultural High School and College, Gatton	6,434·36	240·042	Duplex of Greyleigh
Brundah Fidget III.	Mrs. K. Henry, Greenmount	6,465·28	232·046	Enchanter of Carawarra

JERSEY.

Mature Cow (over 5 Years), Standard 350 lb.				
Oxford Favourite Queen	E. Burton and Sons, Wanora	5,785·92	377·648	Oxford Renown
Glengarry Tirania 4th	J. and R. Williams, Crawford	7,428·7	392·729	Glengarry Benedictines Heir
Senior, 4 Years (over 4½ Years), Standard 330 lb.				
Langside Quip	G. W. Young, Inverlaw	6,577·75	396·701	Masterpiece Yeribee of Brucevale
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Lavender of Calton (365 days)	E. Burton and Sons, Wanora	15,248·97	773·424	Prince Clair of Calton
Golden Lassie of Inverlaw	R. J. Crawford, Inverlaw	6,455·35	351·616	Langside Claribella Masterpiece

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—*continued.*			
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Langside June Twylish	G. W. Young, Inverlaw	6,497·0	322·53	Masterpiece Yeribee of Brucevale
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Wyreene Pet	J. B. Keys, Gowrie Little Plains	5,343·6	261·281	Goldfinder's Prospector of Morago
College Silva	Queensland Agricultural High School and College, Gatton	5,619·21	332·295	College Silverside
Langside Prim	G. W. Young, Inverlaw	6,158·85	317·154	Masterpiece Yeribee of Brucevale
Glenview Mabel	F. P. Fowler and Sons, Coalstoun Lakes	4,550·85	271·897	Trinity Officer
College Pearl	Queensland Agricultural High School and College, Gatton	4,929·71	270·552	Burnside Defender
College Pixie	Queensland Agricultural High School and College, Gatton	5,043·6	265·563	Burnside Renown
Xenias Charm of Inverlaw	R. J. Crawford, Inverlaw	4,863·6	237·977	Montrose Gypsy of Glen Iris
	RED POLL.			
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Marshlands Prudent Farmer 2nd	C. E. McConnell, Marshlands	7,357·85	279·666	Silver Spring Bulwark
	FRIESIAN.			
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Oaklands Beauty Rock 5th	W. Richters, Tingoora	8,595·45	328·928	Pied Rock
Oaklands Fanny Rock 2nd	W. Richters, Tingoora	7,921·34	305·254	Pied Rock
Oaklands Winara Rock 3rd	W. Richters, Tingoora	7,906·63	287·559	Pied Rock
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Oaklands Holly Pearl 8th	W. Richters, Tingoora	7,409·03	273·414	Pied Rock

PLATE 274.—THE VALLEY OF THE TWEED.
From Queensland's Southern Border.

Photo.: "Courier-Mail."

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Club, and the Red Poll Cattle Society, production charts for which were compiled for the month of September, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (over 5 Years), Standard 350 lb.				
Penrhos Pansy	A. Sandiland, junr., Wildash	13,066·5	569·177	Strathdhu Admiration II.
Elsie of Blacklands	H. D. Giles, Biggenden	10,761·9	496·870	Jeans Monarch of Blacklands
Dinky of Bellwood	S. J. Currant, Gunalda	8,513·5	398·582	Triumph of Oakvale
Amy of Glenleigh	C. O'Sullivan, Greenmount	9,710·7	396·040	Brightlight of Darbalara
Necklace of Hilltop	J. A. Heading, Murgon	9,340·09	365·807	Major of Rosemount
Senior, 4 Years (over 4½ Years), Standard 330 lb.				
Rocklyn Baroness	T. Strain, Wondai	10,614·31	374·295	King of Sunnyside
Glenroy Pearl	W. F. Kajewski, Glencoe	8,681·23	358·704	Brilliant 2nd of Oakvale
Merridale Lady Gentle	H. D. Giles, Biggenden	8,017·7	348·736	Reflection of Blacklands
Junior, 4 Years (under 4½ Years), Standard 310 lb.				
Rocklyn Heather	T. Strain, Wondai	8,359·56	368·742	King of Sunnyside
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Burradale Daisy 15th	W. F. Kajewski, Glencoe	8,046·74	356·339	Lovely's Earl of Glenthorn
Dnalwon Cherry 2nd	B. J. Nothling, Witta, Maleny	8,379·2	336·628	Limelight of Raleigh
Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Navillus Amy 2nd	C. O'Sullivan, Greenmount	9,326·75	401·97	Midget's Sheik of Westbrook
Navillus Princess	C. O'Sullivan, Greenmount	9,584·61	374·285	Triumph of Comberton Grange
Merridale Laura	H. D. Giles, Biggenden	5,905·9	271·560	Reflection of Blacklands

Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Glenroy Emerald	W. F. Kajewski, Glencoe	9,111·78	351·386	Glenroy Kitchener
Damsel 10th of Glenthorn	W. F. Kajewski, Glencoe	7,669·68	325·377	Shamrock's Triumph of Burradale
Honey 8th of Sunnyside	P. Moore, Wooroolin West	7,566·31	298·849	Bruce of Avonel
Mirth 3rd of Blacklands	A. Pickels, Wondai	6,513·15	290·405	Orama of Blacklands
Junior, 2 Years (under 2½ Years), Standard 230 lb.				
College Rascal 2nd	Queensland Agricultural High School and College, Gatton	8,004·55	337·043	Fussy's Kitchener of Hillview
College Stately 2nd	Queensland Agricultural High School and College, Gatton	6,194·42	308·546	Duplex of Greyleigh
Glenroy Chrystal	W. F. Kajewski, Glencoe	7,055·89	283·27	Digger of Burradale
Rosenthal Hope 15th	R. V. Littleton, Crow's Nest	5,935·56	268·518	Rosenthal Handsome Boy
Rosenthal Lilac 3rd	S. Mitchell, Warwick	5,918·25	254·371	Handsome Boy
JERSEY.				
Senior, 4 Years (over 4½ Years), Standard 330 lb.				
Billabong Daisy	J. Mollinhauer, Moffattdale	8,129·46	415·068	Premier of Calton
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Linda of Calton	F. J. Cox, Imbil	6,495·15	341·453	Prince Clair of Calton
Junior, 3 Years (under 3½ Years), Standard 270 lb.				
Trecarne Jean	R. A. Slaughter, Clifton	7,683·67	391·671	Mascot of Brassaldale
Langside Hurette Hope	G. W. Young, Inverlaw	5,669·2	323·860	Masterpiece Yeribee of Brucevale
Wyreene Rose Marie	J. B. Keys, Gowrie Little Plains	5,780·04	284·626	Lyndhurst Victor
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
G. N. Loda 2nd	Cox Bros., Maleny	4,794·8	299·719	Retford Royal Atavist
Junior, 2 Years (under 2½ Years), Standard 230 lb.				
Camelon Princess	H. Neil, Brassall	5,169·17	323·695	Carnation Prince's King
College Starbright 3rd	Queensland Agricultural High School and College, Gatton	5,541·83	309·220	Burnside Defender
G. N. Hecla	Cox Bros., Maleny	5,136·15	277·475	Retford Royal Atavist
Twylish Madeira of Pine Ridge	F. J. Cox, Imbil	4,973·35	275·494	Newhills Mascot
Hampstead Gold Star	Cecil Roberts, Harristown	3,893·75	235·281	Kelvinside Favourite's Raleigh
Wyreene Rosella	J. B. Keys, Gowrie Little Plains	4,562·14	233·080	Goldfinder's Prospector of Moray
G. N. Princess	Cox Bros., Maleny	4,132·35	231·707	Retford Royal Atavist

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
FRIESIAN.				
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Oaklands Winana Rock II.	W. Richters, Tingoora	8,155·05	315·066	Pied Rock
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Oaklands Rock Maid III.	W. Richters, Tingoora	8,773·38	303·534	Pied Rock
Oaklands Holly Pearl VII.	W. Richters, Tingoora	7,103·44	254·250	Oaklands Pied Rock 3rd
RED POLL.				
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Marshlands Marruth Farmer	C. E. McConnell, Marshlands	5,176·17	235·237	Marshlands Farnese

Crown Land for Selection.

YAPPOO EXPIRED HOLDING, HUGHENDEN DISTRICT. SHEEP LAND.

PORTION 2, parish of Yappoo, 26,000 acres, situated about 50 miles north from Nelia, on the Saxby River, will be open for Grazing Homestead Selection at the Land Office, Richmond, on Thursday, 13th December.

Term of lease, 28 years; rent, 2d. per acre for the first seven years of the term. Provisional valuation of the existing improvements, £412. These consist of fencing and bore drains. The country consists of open undulating downs, well grassed with Mitchell, Flinders, Blue, barley, and other grasses. Generally well shaded.

The land is good sound sheep country, suitable for wool-growing and lambing purposes.

Watered by drains from two bores on Bunda Bunda Holding and by billabongs along the Saxby River. Supplies are ample for the carrying capacity of the block.

Stocking conditions will apply.

Free lithographs and full particulars obtainable from the Land Agents, Hughenden and Richmond; the Land Settlement Inquiry Office, Brisbane; and the Government Intelligence Bureaux, Sydney and Melbourne.

PLATE 275.

Members of the 1934 School of Instruction in Pig-raising at the Queensland Agricultural College, Gatton.

Seated in the centre of the front row is Lt.-Colonel A. J. MacKenzie (Chief of the College Veterinary Staff); on his right is Mr. E. J. Shelton (Senior Instructor in Pig Raising, Department of Agriculture and Stock), and on his left is Mr. C. J. McGrath (Supervisor of Dairying, Department of Agriculture and Stock).

PLATE 276.—JUNIOR MEMBERS OF THE BRISBANE LEGACY CLUB.

(On the occasion of an instructional visit to the Department of Agriculture and Stock, 29th September.)

The Legacy Club is an association of ex-service men who have voluntarily assumed the guardianship of war orphans and the sons and daughters of ex-sailors and soldiers who have died or become permanently incapacitated since the war. In this spirit Legacy carries on, overcoming difficulties as they arise, shunning personal publicity, and proving quietly but splendidly that the spirit of the Australian Imperial Force has survived, and is still an effective force in Australian national life.

Answers to Correspondents.

BOTANY.

Replies selected from the outward mail of the Government Botanist, Mr. Cyril White, F.L.S.

Saltbush and Related Plants. Books on Botany.

H.R.L. (Gympie)—

Regarding the family *Chenopodiaceæ*, the following are some common plants in Queensland:—

Old Man Saltbush (*Atriplex nummularia*).
Saltweed or Creeping Saltbush (*Atriplex semibaccata*).
Blue Bush (*Chenopodium auricomum*).
Fish Weed (*Chenopodium triangulare*).
Cotton Bush (*Kochia villosa*).
Galvanised Burr (*Bassia Birchii*).
Fat Hen (*Chenopodium album*).

Books on Australian botany:—

An Elementary Text-book of Forest Botany, by C. T. White. Price, 7s. 6d.

The Story of Our Plants: First Steps in Australian Botany, by Constance M. le Plastrier. Price, 2s.

Intermediate Botany, by A. B. Katley. Price, 2s.

The last two are published by the Shakespeare Head Press, Sydney, but all three books should be obtainable from any bookseller.

"Vegetable Oyster."

M.R. (Toowoomba)—

The specimen is *Tragopogon porrifolius*, the Salsify or Vegetable Oyster, cultivated on account of its edible root. It is very seldom seen in Australian gardens. It is now and again seen as a stray from cultivation on the Downs, and, like chickory and some other plants, when it becomes wild the root is less esculent. We were quite pleased to get the specimen.

Plants from Winton Identified.

R.C. (Winton)—

The specimens have been determined as follows:—

Blennodia trisecta, a herb moderately common in parts of Western Queensland, but we have not heard a common name for it. It should be quite good fodder. The characteristic mentioned—that stock will not eat it until it is dry—seems to be a very common feature among Western Queensland plants. It would probably taint the milk of cows pretty badly, like most plants of the family, but this is not likely to worry you.

Zygophyllum glaucescens, Twin leaf. We were interested in your remarks that sheep eat the plant both green and dry.

Craspedia chrysantha, sometimes called Billy Button. We do not think there is any foundation at all for the belief that this plant causes blindness in horses.

Helychrysum podolepideum, a small species of the Everlasting family. If you could send us a larger specimen of this plant for our collections, the favour would be much appreciated.

Rhagodia linifolia, a plant of the Saltbush family. We should think that stock would eat this plant, particularly when it was drying off.

The Spanish Reed.

E.A. (Wondai)—

The specimen is not Pampas Grass, but *Arundo Donax*, the Spanish Reed, much cultivated as an ornamental grass in Australia and most warm, temperate countries. We have not heard of its being used as a fodder before, and on the whole it seems rather caney. If you are going to plant a small plot for trial purposes, however, it would be as well to cut the plant down every spring and let it shoot forth again. In the Southern States it is commonly called Bamboo, but is not a true Bamboo.

Rough Poppy.

A.W.J. (Lanefield)—

The specimen you send is one of the popies, *Papaver hybridum*, sometimes called the Rough Poppy. So far this poppy has not become a serious pest, at least in the lowland parts of the State. All of the membere of the poppy family are more or less suspected of being poisonous, as several of them contain alkaloids, such as morphine. However, so far as we are aware, no cases of poppy-poisoning have come under notice in this State. It is as well that you destroyed the plants you saw, as we already have too many weeds to cope with. *Papaver hybridum* has been recorded from the Darling Downs and the neighbourhood of Brisbane.

Caustic Vine.

A.F.M. (Hughenden)—

The specimen is, as you supposed, *Sarcostemma australe*, the Caustic Vine. This plant is widely spread through Queensland and Central Australia, occurring from the coast to the far interior. Reports regarding its poisonous character are very conflicting. It has even been spoken of in South Australia as quite good fodder. Feeding tests, however, recently carried out, definitely show that the poisonous properties generally ascribed to the plant in Queensland are founded on fact.

Buttercup Bush.

N.A.R.P. (Toowoomba)—

The specimen represents *Cassia eremophila*, commonly known as Buttercup Bush. It is a native of Western Queensland, is easily propagated from seed, and, we think, is worthy of a place in every garden. There were some fine plants of it growing in the Brisbane Botanic Gardens, but they died out and were not replaced. Like most Cassias, we think it wants replacing every few years.

Grasses Identified.

Fodder Project Club (Pullen Vale)—

Couch Grass (*Cynodon Dactylon*). This grass is widely spread over the tropical and subtropical regions of the world. It is a very nutritious grass, palatable to stock, but does not produce a great body of feed.

Buffalo Grass (*Stenotaphrum secundatum*). A native of tropical America now naturalised or cultivated in most warm countries. At one time it was used very extensively for lawns, but now is not used so much, its place being taken by the Blue Couch (*Digitaria didactyla*). It was one of the grasses grown many years ago on felled scrub areas, but is seldom seen now, except on old settlements, having given way to Paspalum, Rhodes, and other grasses.

Blue Couch (*Digitaria didactyla*). This grass is now very abundant in coastal Queensland. It is quite a good fodder, but is very dominant and apt to overrun pastures on better-class country where Paspalum and other grasses of higher-carrying capacity could be grown.

Red Natal Grass (*Rhynchelytrum roseum*). This is a native of Africa now widely spread over most tropical and subtropical countries. Reports concerning its fodder value are rather conflicting, but we do not seem to have a particularly good strain in Queensland. It is very common as a weed of cultivation on fruit farms in the coastal belt, and makes excellent "chop-chop" for horses and cattle, particularly when mixed with more palatable fodders.

Wild Sorghum.

W.S. (Spring Hill)—

The specimen of grass represents *Sorghum verticilliflorum*, commonly known as Wild Sorghum. It is an African grass, now very common in parts of Queensland, particularly along railway embankments, roadsides, cultivation headlands, &c. It is a perennial, and rather coarse in growth. It should be readily eaten by stock, but is strongly cyanophoric—that is, it contains quantities of a prussic-acid-yielding glucoside. This poisonous glucoside is present in a number of Sorghums, but is particularly marked in the present species. On the whole, its cultivation is not recommended.

Wall Barley.

O.G.S.M. (Warra)—

The specimen represents *Hordeum murinum*, the Wall Barley, a common European grass mostly met with in Queensland as a weed of cultivation. It is commonly seen around horse yards, &c., where feed has been spilt. It is of very little value as a fodder and should not be encouraged.

Sandalwood.

C.E.Y. (Noondoo Siding)—

The specimen bore neither flowers nor seed-pods. The bodies you took for fruit are really insect galls. We should say, however, that it represents the true Sandalwood (*Santalum lanceolatum*). The wood of this tree is largely exported from North Queensland, Thursday Island being the chief port of export. Until recent years we were always under the impression that the Northern tree alone had scented wood, but recently we have seen specimens from Charleville, Dalby, and other places in which the wood was quite scented. In these, however, the trees were very old and large, and the heartwood alone had any marked scent. Small trees, so far as we have observed, have no scent at all—at least, in the southern parts of the State. In Southern Queensland it is not often known as Sandalwood, but is most frequently known as Plum Tree owing to the little plum-like fruits is possesses. It is generally regarded as quite good stock food, and would have more value, we think, in the South from this point of view than for the actual wood. As you know, the name Sandalwood is generally given in Southern Queensland to a totally different tree—*Eremophila Mitchelli*, also found in New South Wales, where it is called Budda. This latter wood has met with no success as a substitute for true Sandalwood, but there does seem some future for it on account of the rich scented oil it contains.

Barbed Wire Grass. Spear Grass. "Black Heads."

T.F. (Goomeri)—

(1) *Cymbopogon refractus*, Barbed Wire Grass. The local name comes from the fact that the spikelets are reversed and occur in clusters along the flowering stem, giving it a superficial resemblance to barbed wire. It is a very common grass in parts of Queensland, but is only of secondary value as a fodder, and is left untouched when more palatable kinds are available.

(2) *Aristida ramosa*, a three-pronged Spear Grass. The local name comes from the fact that the seed is provided with three prongs or awns, which assist the plant in being carried about from one place to another. Aristida grasses are very common in parts of Queensland, and, on the whole, are not of much value as fodder. The spear-like seeds work their way under the skin of sheep.

(3) *Pappophorum nigricans* var. *arenicolum*, sometimes called Black-heads. It is a fairly common grass in some of the mixed native pastures of Queensland, and is probably of secondary importance, although grasses of this type are sometimes of value in making a mixture in the pasture.

Gall Weed. Yellow Daisy. Stagger Weed.

A.J.G. (Duleen, Tara Line)—

Your specimens have been determined as follows:—

(1.) *Zygophyllum apiculatum*, Gall Weed or Twin Leaf. A very common weed that overruns much of the Brigalow country in the mid-West. It is not known to be poisonous, though stock rarely, if ever, seem to touch it.

(2.) *Senecio lautus*, sometimes called Yellow Daisy in Western Queensland. It is very common in some parts, particularly on light forest soils bordering on to the Brigalow country. It seems to be eaten to a limited extent, and is not known to contain any harmful properties.

(3.) *Stachys arvensis*, Stagger Weed, sometimes also called Mint Weed, but not to be confused with the Mint Weed common in the Pittsworth district and to which a good deal of publicity has been directed. As the common name implies, the plant produces "staggers" or "shivers" in stock, but animals have to be driven, worked, or excited in some way before any symptoms are shown. Ordinary resting paddock stock, such as dairy cattle, calves, &c., feed on the plant with impunity.

Sun Hemp.

E.R. (Ambrose)—

Your specimen represents *Crotalaria juncea*, the Sun Hemp, sometimes also known as Rattle-pod, a name applied in general to members of the genus Crotalaria. It is a native weed but is widely spread through the Malayan Region to India. In India a form of the plant is cultivated for fibre, the treatment being somewhat the same as that accorded to flax. It is also valuable as a green manure. We have no record of the plant's effect on stock, but in view of the fact that several members of the genus Crotalaria, both in Australia and abroad, have been proved definitely poisonous to stock, it is as well to regard it with suspicion. We do not think the plant has any economic value in Australia.

Date Palms. Coconut Palms.

A.L. (Gunalda)—

You should be able to obtain date palms and possibly coconut palms from the Curator, Botanic Gardens, Rockhampton, as this institution makes a practice of selling plants. If the Curator at Rockhampton does not have coconut palms, they should be obtainable from the Curator, Botanic Gardens, Townsville. We think this institution also sells plants.

In getting date palms, it is best to get suckers from the female tree, as the male flowers and female flowers are on different trees, the female, of course, only bearing fruit. In the cultivation of dates for drying, the female flowers are generally artificially pollinated, but this is a very simple business. Ordinary dates often come up about places where seeds have been accidentally thrown and really germinate quite well: so if you are not particular about being sure of male and female plants, you could probably raise your own plants from the seeds of ordinary packet dates.

Coconut palms can be raised by placing the whole coconut, including the dry husk, either sideways in the soil or burying about two-thirds or three-quarters under the ground, the sharp end downwards.

Weeds from Gayndah Identified.

W.S.K. (Gayndah).—The Bundle of specimens taken from your farm have been determined as follows:—

(1) *Rumex crispus*, Curled or Yellow Dock. A very common weed in Queensland not known to be poisonous or harmful in any way.

(2) *Stachys arvensis*, Stagger Weed or Wild Mint. This plant is quite a good fodder for dairy cows and ordinary resting paddock stock, but gives working horses or travelling stock "shivers" or "staggers." Animals recover, however, if taken off the plant and put on to ordinary feed. It is not to be confused with the Mint Weed to which so much publicity has been given in the press during the last couple of years, and which is of rather greyish appearance with spikes of bluish flowers.

(3) *Rahpanus Rhapanistrum*, Wild Radish or Jointed Charlock, mostly known in Queensland as Turnip Weed. It taints the milk of dairy cattle very badly, but we do not think it is as bad as Nos. 4 and 5.

(4) *Senebiera didyma*, Bitter Cress or Wart Cress. A very common weed in Queensland and one of the very worst we have to taint the milk of dairy cattle.

(5) *Lepidium ruderale*, a Pepper Cress. Like other members of the family Cruciferæ, it is commonly known in Queensland as Mustard Weed or Turnip Weed. It is a very bad weed to taint the milk and cream of dairy cows.

Nos. 3, 4, and 5 are not known to possess any poisonous properties.

Birds'-Foot Trefoil.

J.B.K. (Kilcoy)—

The specimen is a species of lotus or bird's-foot Trefoil. From the small specimen submitted we should say it was the native species, *Lotus australis*, moderately common in some places and generally regarded as quite a good fodder. In New South Wales it is sometimes called Barwon lucerne. Stock are fond of the plant, but like most of the bird's-foot trefoils it contains a prussic-acid yielding glucoside, although trouble from the plant seems to be very rare.

Pandanus.

C.F.J. (Pialba)—

The common "Breadfruit Tree" of Fraser Island and other parts of the Queensland coast is a species of Pandanus. It is a totally different plant to the true Breadfruit of the South Sea Islands, which is *Artocarpus incisa*, a tree very closely allied to our familiar Jak-fruit. We do not know how the name came to be applied to the Pandanus except that the head of fruits is big and perhaps superficially resembles that of the true Breadfruit. The true Breadfruit or *Artocarpus* is, of course, a very important article of diet on all the islands of the South Seas. There are numerous varieties, the best ones being seedless, and the tree is easily propagated from cuttings. It was introduced into North Queensland some years ago, and there were good trees growing at the State Nursery at Kamerunga, although we have not seen one in Queensland for some time past.

Wall Barley. Whiteheads. Prairie Grass. Hexham Scent. Burr Trefoil. Prickly Lettuce. Improvement of Carrying Capacity.

J.F.K. (St. George)—Your specimens have been determined as follows:—

1. *Hordeum murinum*, Wall Barley; moderately common as a weed during the winter and spring months. It dies out on the approach of hot weather. It provides a bit of food when young, but soon becomes unpalatable and of very little value as a fodder.

2. *Pappophorum avenacea*, Whiteheads; a fairly common grass in parts of Queensland. We were very interested in your remarks that it was ousting the wire grass on the red loam soils on your property. This is very important. The only drawback is that so far as our experience goes *Pappophorum* grasses on the whole are rather unpalatable. What is your experience with the present plant? Could we have a specimen of your wire grass to determine the actual species? The name "Wire Grass" is given in Queensland mostly to the species of *Aristida*. They are very abundant on the lighter soil of the Western Darling Downs and Maranoa districts, and although edible in their younger stages, they soon become harsh and unpalatable. Bullocks will eat them, however, when driven on to them by hunger and the absence of other food.

3. *Bromus unioloides*.—This is the common prairie grass cultivated in Queensland. It is one of the best of the winter grasses, but on the whole seems to want cultivation to succeed well. It is quite a common thing to see it come up spontaneously around homestead gardens. When spread in the brigalow country it carries on for several years, re-seeding itself, but eventually becoming more or less confined to the melon holes.

4. *Melilotus parviflora*, the Melilot or Hexham Scent. Some years ago this plant was boomed as a fodder under the name of King Island Melilot. So far as our experience goes, however, stock do not take to it very readily. It also taints milk very badly if cows feed on it to any extent, but beyond that it does not contain any harmful properties. The seed sometimes contaminates wheat, giving an objectionable odour and flavour to the flour.

5. *Medicago denticulata*, a Burr Trefoil; one of the best of the annual trefoils and clovers. The only disadvantage is that the burrs are troublesome in belly wool of the sheep. Stock on the whole seem to prefer the plant when it is dying off somewhat, to whon it is green and luxuriant.

6. *Lactuca scariola*, Trickly Lettuce; rather a bad farm weed in some parts of Queensland.

The question raised by you as to the possibility of improving the carrying capacity of much of the Western Darling Downs and Maranoa districts at present covered by Wire Grasses is an extremely important one and worthy of attention. Some time ago the Department supplied from the State farm at Bungeworgorai a number of roots of Woolly Finger Grass (*Digitaria eriantha*) to Dr. Hirschfeld for the same purpose; that is, the running out of the Wire Grass by another and more vigorous-growing species. Dr. Hirschfeld tells us that the Woolly Finger Grass is doing better on the sandy soils infested with Wire Grass than it is on the heavier black-soil country.

Macrozamia.

J.R. (Yeerongpilly)—

The specimens collected near Springsure represent *Macrozamia Moorei*, very common in that district. Its effects on horses are said to be that they stagger somewhat in their front legs and step high. They eventually go almost blind from the effect of the plant. Trouble is caused in two ways, mostly from stock eating the young plants, and sometimes from their eating the fallen seeds. In cattle the symptoms are somewhat different, rickets and loss of control of the hindquarters being frequent symptoms.

Trees Suitable for the Callide Valley.

O.W. (Biloela)—

Following is a list of trees that should grow in your locality:—Burdekin Plum Mango (worth trying if your winters are not too severe); Coral Tree (Erythrina); Poinciana (the same remarks apply as to the Mango); Jacaranda; Algaroba Bean; Camphor Laurel; Silky Oak; *Celtis sinensis*, deciduous, commonly called Box Elm, in our opinion one of the handsomest trees for a position such as yours and it also has the advantage that the leaves are good fodder for stock; Phytolacca or Bella Sombra Tree, a very quick-growing species with a very spreading, gouty stem; the leaves are quite good fodder for stock; pines of various sorts (probably the best for your purpose would be the long-leaved Chir pine, *Pinus longifolia*, Torulosa Pine, *Cupressus torulosa*), Cotton Palm, *Washingtonia*, Wine Palm, *Coccus Yatay*. The nearest source of supply of young trees would probably be the Botanic Gardens, Rockhampton, and we would advise you to get in touch with the curator. If you wish to raise the trees yourself from seed, the seeds should be sown in flats or prepared beds, then preferably put into pots or old tins and eventually planted out into their permanent situations. It is getting rather late for planting this season, although the more tropical types of plants such as the Burdekin Plum, Mango, Coral Tree, and Poinciana are best planted now.

Windbreaks at Jandowae.

C.W.McG. (Brisbane)—

Regarding trees suitable for growing as a windbreak for dairy stock in the Jandowae district, we think one of the pines would be as satisfactory as any; we take it that a fairly quick-growing tree is required. Of these, we would recommend either the Insignis pine (*Pinus radiata*) or the *Torulosa* pine (*Cupressus torulosa*). Both are obtainable in quantities from most nurserymen. The Torulosa pine is a species of Cypress pine, and varies a good deal in character. For ordinary purposes, such as a windbreak, seedling trees should suffice, but, of course, they do not come true to type. Trees raised from cuttings are more reliable in this respect, but are more expensive.

Woolly Clover.

W.S. (Cooyar Line)—

The specimen represents the Woolly Clover (*Trifolium tomentosum*), an annual clover that is now and again seen growing spontaneously in parts of Southern Queensland. It grows during the winter and spring months, dying off with the approach of the hot summer weather. We have little knowledge of its value as a fodder, but most of these annual clovers are of value as they come in at a time when grass is short.

Bitter Pitted Blue Grass. Rat's Tail Grass.

T.G. (Nerang)—Your specimens have been determined as follows:—

1. *Bothriochloa decipens*, Bitter or Pitted Blue grass, also known as Red-leg or Red grass. Our general experience with this grass is that it has very little value as a fodder, and stock do not take to it unless driven by hunger or absence of other feed. The Blue grass about Miles you refer to is *Dichanthium sericeum*.
2. *Sporobolus Berteroanus*, Parramatta grass or Rat's Tail grass, a native of South America now naturalised in most warm temperate countries. It has caused some concern in some of the coastal districts as an invader of the Paspalum pasture.

Cockspur Thistle ("Saucy Jack.")

W.B. (North Tamborine)—

The specimen represents the Cockspur Thistle (*Centaurea melitensis*), a native of Southern Europe, now a common naturalised weed in many warm temperate countries. We think it is much more abundant in the Southern States than in Queensland, and here it is mostly found on the Darling Downs. It is a very bad weed in parts of New South Wales, and is commonly called "Saucy Jack." The plant is said to have some fodder value in its younger stages, but to be soon neglected by stock. Its destruction is recommended.

European Bindweed.

H.J. (Stanthorpe)—

Your specimen represents *Convolvulus arvensis*, the European Bindweed, a particularly pernicious pest once it gets into cultivation. It is fairly common in some of the Southern States, but up to the present it has not much of a hold in Queensland. We have had a few specimens from the Darling Downs, but this is the first time from the Granite Belt. Every effort should be made to eradicate it. A leaflet on the weed has been posted to you.

Yellow Dock.

M.D.O'D. (Gympie)—

The specimen represents *Rumex crispus*, the Yellow Dock or Curled Dock, a common European plant now abundant as a naturalised weed in many parts of Australia. It is quite a common weed in Queensland on cultivation areas and waste places such as town allotments, &c. It is not known to possess any harmful or poisonous properties.

English Meadow Grass.

E.G.T. (Maleny)—

The specimen is *Poa annua*, the English Meadow Grass, a common European grass now fairly common in many parts of Queensland. It is particularly abundant during the late winter and spring months, and dies out on the approach of hot weather. It is quite a useful fodder while it lasts. It is more often seen as a weed of cultivation than in the pasture, although of recent years it seems to have invaded some of the pastures in the coastal belt.

Canary Grass.

C.A.M. (Cooroy)—

The specimen represents the common Canary Grass (*Phalaris canariensis*). This grass is mostly grown for canary seed rather than as a fodder. Two other Canary Grasses are grown in Queensland, namely *P. minor* (annual) and *P. tuberosa* (perennial). The latter is an excellent fodder grass, especially valuable during the winter months. Seeds of Canary Grass should be sown preferably in April or May.

Useful Shrub for Coastal Lands (*Vitex trifolia*).

A.C.H. (Bowen)—

The shrub *Vitex trifolia* is a common native seaside shrub in Queensland. It is a particularly valuable shrub for planting in coastal areas to stop sand drift. There are several forms in North Queensland; one creeps over the sand, and this form is very abundant on the esplanade at Townsville; you probably also have it at Bowen. The form most favoured for planting is a shrubby one generally growing about 6 to 8 feet high. The leaves are green above and generally whitish beneath. The flowers are blue, the berries at first green and eventually black. It can be propagated from seed, but should strike quite readily from cuttings. A variegated form, variety *variegata*, is moderately common in Queensland gardens. In regard to the roots you have, if you want to make a hedge of these I would plant them about 3 feet apart. The present time is a very suitable one for doing the work, but if the weather is at all dry the plants should be kept watered and preferably mulched for a week or more after planting.

Johnson Grass.

W.P.C. (Roadvale)—

The specimen represents the Johnson Grass (*Sorghum halepense*), mostly seen in Queensland as a weed of cultivation. When once it gets into a cultivation it is difficult to eradicate. It is a moderately good fodder, but like other members of the Sorghum family contains a prussic-acid yielding glucoside, and therefore must be fed with care. Cutting and allowing the plant to wilt renders it safer. Pigs are very fond of the white underground runners, and though they are often eaten by them without harmful results we have heard of cases of death resulting, as these runners contain the same poisonous principle as the green leaves.

"Wild Lucerne." ***Sida retusa.***

T.G. (Nerang)—

The Wild Lucerne of Brunette Downs is *Psoralea cinerea*, a native of the Northern Territory and North-western Queensland. It is much more of a lucerne-like plant in appearance than the *Stylosanthes*, growing upright and not trailing along the ground. The so-called Wild Lucerne of Darwin is the same as the "Townsville Lucerne." The correct botanical name is *Stylosanthes sundaica*, the other name (*Stylosanthes mucronata*) being merely a synonym. By the rules of botanical nomenclature the name *sundaica* has priority and has got to be used. We hope this clears up the matter.

Sida retusa is quite a good stock feed, although I do not know that it has been analysed to find its actual food value. In parts of New South Wales it is very abundant, and is commonly known as "Paddy's lucerne." I do not know that it would have any effect on stock. The leaves are somewhat mucilaginous when chewed and may assist in passing dry fibrous food. The stems of *Sida retusa*, of course, are exceedingly fibrous.

Henbit or Dead Nettle.

J.B. (Chinchilla)—

The specimen represents *Lamium amplexicaule*, the Henbit or Dead Nettle, a common weed of the Northern Hemisphere now quite common in many parts of Queensland and the Southern States. It is closely allied to the common Stagger Weed, and like that plant is capable of causing "shivers" or "staggers" in stock. The animals, however, have to be worked, driven, or excited in some way before any symptoms are manifested. For ordinary paddock resting stock such as calves and dairy cattle the plant is quite good fodder.

Whitewood and "Walk-about" Disease.

C.W. (Butcher Hill)—

The Whitewood is a small tree fairly abundant in many parts of Queensland, stretching through the Northern Territory to the Kimberleys in Western Australia. We have posted you under separate cover a small branchlet showing the leaves. The tree bears a mass of small white flowers, and these are followed by very characteristic winged "seeds." It would be interesting to know if this tree occurs in your locality. Although the case seems definitely proved against Whitewood, many stockowners and veterinarians are of the opinion that Whitewood is not the only cause of the "Walk-about" disease common in parts of Northern Australia. One of the reasons given for this is that "Walk-about" disease occurs where Whitewood is absent or at most rather rare.

A Common Pasture Herb.

H.P. (Kolan River South)—

The specimen is *Geranium dissectum*, a very common pasture herb in Queensland and New South Wales. On the Darling Downs and inland pastures generally it is most frequently referred to as Crow's-foot, and is favoured by sheep. In addition to the leafy foliage the older plants possess a small, carrot-like root which is relished by stock, particularly sheep. The herb is sometimes seen in the mixed native pastures on the coast, but stock do not seem to take to it readily as they do in the inland parts of the State. Perhaps the plant makes a ranker growth on the coast, and is consequently less palatable.

General Notes.

Staff Changes and Appointments.

Mr. A. E. Mitchell, Slaughtering Inspector, Warwick, has been appointed also an Inspector under the Diseases in Stock Acts.

Mr. A. J. Hicklin (Sandgate) and Mr. E. L. T. Boyce (care Main Roads Commission, Brisbane) have been appointed Honorary Rangers under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. C. P. Joyner, Inspector of Stock, Cooyar, has been appointed also an Inspector under the Dairy Produce Acts.

Mr. J. Wyvill, Inspector of Stock, Nanango, has been appointed also an Inspector under the Slaughtering Act.

Mr. E. R. Boyd, Inspector of Dairies, Nanango, has been appointed also Inspector under the Diseases in Stock Acts.

Mr. P. P. Comiskey, Inspector of Stock, Boonah, has been appointed also an Inspector under the Dairy Produce Acts.

Mr. T. Brett, Inspector of the Moreton Rabbit Board, attached to Mount Lindesay, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. E. R. Cronau (Newmarket) has been appointed an Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock.

Mr. R. B. Norwood, Assistant Pathologist, Department of Agriculture and Stock, has been appointed also an Inspector under the Diseases in Plants Acts.

Mr. G. W. J. Agnew, Inspector under the Diseases in Plants Acts, has been appointed also an Agent under the Banana Industry Protection Act.

Messrs. J. J. Shelvey and J. Bishop, Inspectors of Stock at Helidon and Kingaroy, respectively, have been appointed also Inspectors under the Slaughtering Act.

Messrs. J. A. O'Neill and D. J. Callaghan, Dairy Inspectors at Gayndah and Mundubbera, respectively, have been appointed also Inspectors under the Stock and Slaughtering Acts.

Mr. J. P. Dowling, Stock Inspector, Gayndah, has been appointed also an Inspector under the Dairy Produce Acts.

Mr. R. E. Watson, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Toowoomba to Goombungee.

Mr. J. Macdonald, of Ayr, has been appointed an Honorary Ranger under the Animals and Birds Acts in connection with the recently declared sanctuaries on Hamilton and Henning Islands.

Mr. A. M. Richardson (Burleigh Heads) has been appointed an Agent under the Banana Industry Protection Act and Inspector under the Diseases in Plants Acts, and will be stationed at Stanthorpe.

Senior Sergeant G. P. Keeffe (Warwick) and Acting Sergeant O. Murphy (Esk) have been appointed also Inspectors under the Slaughtering Act.

Mr. E. G. Lawrance (Maleny) and Mr. E. Teitzel (Mount Mee West) have been appointed Honorary Rangers under the Animals and Birds Acts and the Native Plants Protection Act.

Constable C. J. Munro (Nebo) has been appointed also an Inspector under the Brands Acts.

Mr. H. Collard, Assistant Instructor in Fruit Culture, has been transferred from Cardwell to Maryborough.

Election of Mill Suppliers' Committees.

Existing regulations under the Primary Producers' Organisation and Marketing Acts relative to the election of Mill Suppliers' Committees and District Cane Growers' Executives have been rescinded, and new regulations issued in lieu thereof. The present method of optional preferential voting for Cane Growers' Association elections is considered unsatisfactory, and accordingly new regulations providing for a system of compulsory preferential voting have been promulgated.

In Memoriam.

KEITH LOCKWOOD GRAHAM.

The announcement of the death of Mr. Keith Lockwood Graham on 11th October was received with profound regret in the several country districts of Queensland in which he had served as manager of branches of the Bank of New South Wales.

The late Mr. Graham was the first manager of the Bank of New South Wales at Murgon, then little more than a name on a railway map. In the early days of that fertile and now very prosperous section of the rich South Burnett, he was among the pioneers of every progressive movement and an influence for good in the business and social life of the youthful community, assisting greatly in its rapid development. As a capable banker and as a guide, philosopher, and friend to the pioneer settlers, his worth was widely recognised.

Mr. Graham was afterwards appointed to the management of the Cooktown and Samarai branches of his bank. In 1922 he was transferred to Eumundi, where he remained for eight years. On 11th October, 1930, an attempt was made by armed burglars to rob the bank. With remarkable coolness and courage, Mr. Graham frustrated the attempt, but was shot twice and dangerously wounded. (It is a coincidence that he died on the corresponding date four years later.) On recovering he was transferred to the Brisbane district relieving staff, and later to the position of manager of the Mount Gambier branch, South Australia. He was afterwards appointed relieving manager in Victoria. Not long ago he became ill and returned to Queensland. He was fifty-five years of age, and unmarried.

Mr. Graham belonged to a well-known Queensland family, who were pioneers in the pastoral industry. He was a native of the Darling Downs, and was educated at the Toowoomba Grammar School. A brother was among the first Australian Light Horse officers to be killed at Gallipoli.

Mr. Graham was a fine cricketer in his younger days, and played for Toowoomba against the late A. E. Stoddart's English Eleven. He also excelled at tennis. To his bereaved relatives deep sympathy is extended.

Slaughtering Regulation.

Regulation No. 39 under the Slaughtering Act has been reissued in a form which now makes it quite clear that the occupier of a butcher's shop shall be the person responsible for seeing that the shop is provided with wire gauze to exclude flies, and to ensure that the doors are kept closed except when in use for ingress or egress.

Hail Insurance.

An amendment of the Hail Insurance Scheme Regulations issued under the Wheat Pool Acts has been approved which will provide that returns for hail compensation shall be lodged with the Wheat Board on or before such day, but not later than 15th September in the year in which the crop is grown, as the Board may determine. The regulation previously provided that returns should be lodged on or before the 15th August in each year.

The Broom Millet Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the operations of the Broom Millet Board for the period from 1st November, 1934, to 31st October, 1937. A petition on the question of the continuance or otherwise of the Board may be lodged by growers on or before the 24th September, 1934.

Deloraine Island a Sanctuary.

Deloraine Island, near Whitsunday Island, Great Barrier Reef, has been declared a sanctuary under the Animals and Birds Acts.

Rolleston-Injune Road a Stock Route.

An Order in Council has been issued under the Diseases in Stock Acts, declaring the Rolleston-Injune road to be a stock route for the purposes of the said Acts. This road was recently opened, by Proclamation under the Lands Acts, as a public road, and may in future be used as a stock route for travelling stock.

The Pig Industry Act.

Executive approval has been given to the issue of a Proclamation bringing "*The Pig Industry Act of* 1933" into operation as from the 23rd August.

Regulations have been approved under the Act, and these cover the examination of graders and inspectors, the grading of carcasses, the management of piggeries, grade definitions, grade certificates, check grading, grade marks, and condemnations.

Tobacco Pure Seed District near Rockhampton.

An Order in Council has been issued under the Tobacco Industry Protection Act constituting a Tobacco Pure Seed District which comprises the area contained within the boundaries of the parishes of San Jose and Ultimo, in the county of Deas Thompson. This district embraces Marmor and Bajool, near Rockhampton.

Sanctuaries in Whitsunday Passage.

An Order in Council has been issued under the Animals and Birds Acts declaring Hamilton and Henning Islands, Whitsunday Passage, to be sanctuaries under the Animals and Birds Acts. It will be unlawful in future to shoot any native animals or birds on these islands.

Provisional Maize Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the constitution of the Provisional Maize Board by extending the term of the Board for a further twelve months. The Board was constituted in October, 1931, for twelve months, and was extended for a similar period in November, 1932.

Fruit Fly in Granite Belt.

A Proclamation has been issued under the Diseases in Plants Acts declaring the Stanthorpe, Killarney, and Warwick districts to be a quarantine area on account of the disease of fruit flies. A Regulation has also been approved under the Acts prescribing the nature of the quarantine to be imposed therein. It will be necessary for orchardists in the districts mentioned to place traps charged with fruit fly lure approved by an Inspector throughout their orchards. The regulation will be in force for the period from 8th October, 1934, to 28th February, 1935.

Citrus Fruit Lands of the Burnett.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) stated recently that he had received a report from the Director of Fruit Culture (Mr. H. Barnes) covering a survey of the Mundubbera district from the aspect of commercial citrus growing.

The report indicated that along the banks of the Auburn, Boyne, and Burnett Rivers there are many acres of suitable citrus soils, ranging from deep sandy soils to chocolate and redy sandy loams. Where the subsoils are of sufficiently open texture to obviate any danger of the retention of excessive moisture, the loamy soils are to be preferred. Good supplies of river water are available for irrigation, without which the cultivation of this fruit should not be attempted in the drier regions.

On the Curgeena and Binjour plateaux the soils are mainly chocolate and red loams, but as there is an absence of water and the rainfall is irregular and insufficient commercial orchards should not be planted.

Of course, added the Minister, every care should be exercised by intending orchardists when determining the site of the grove, and in this connection planters would be well advised to seek the advice of Departmental Instructors, who are always willing to assist in every possible way.

The varieties recommended for the main plantings are Washington Navel and, to a lesser degree, Valencia Late. In warm situations free from frost the Villa Franca and Lisbon Lemons will do well, as also will the Beauty of Glen Retreat Mandarin.

Rural Topics.

Care in Handling Pigs.

Under normal conditions around the farmyard, and all other things being equal, it is reasonable to consider the domestic pig as being of even, contented temperament —an animal, who, though stubborn by nature, is easily handled if given reasonable care. A report published recently of a young man at Skyring's Creek, Pomona, being attacked by a boar and receiving nasty wounds as a result of the boar using his sharp tusks and teeth too freely indicates the urgency of being ever careful when feeding and attending to this class of animal. No mention was made of any extenuating circumstances in the case referred to, but it often happens that a boar pig (in particular) comes in for rather bad treatment at the hands of farmers who are short-tempered themselves, and thus when both the attendant and the animal become excited an accident is almost certain to occur, and, if it does, the strongest and the quickest wins. Boars should not be permitted to run with sows and other pigs, but should be kept in a properly constructed boar yard, into which no one should enter without providing himself or herself with a stout cane with which to protect one's self if need be.

It is an offence under the Pig Industry Act to ill-treat a pig in any way and to beat a pig with a whip, stick, or other instrument capable of bruising or damaging the carcass of such animal; hence the added necessity for care in handling, to avoid any call for rough treatment on the part of either man or beast. If reasonable precautions are observed, there is little risk of trouble. However, it is a wise procedure, and not an impossible one, to remove the sharp tusks of the boar pig before he reaches the age of one year, or to remove them if they have grown and the animal is over twelve months of age. A pair of blacksmith's bolt-cutters is the safest and best instrument to use in removing the tusks, and to do this, of course, necessitates tying the animal up to a very stout post or rail. It is a very wise thing to nip off the sharp black teeth of sucking pigs before they are one month old, for, although they are only small, they can do a great deal in irritating the sow if they fight, and lacerate her teats with the sharp black teeth which they possess. After removal of the tusks or teeth, ordinary care only is necessary to prevent infection.—By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

Triumph of Herd Testing.

All thoughtful and far-seeing dairy farmers have always rightly believed that persistent herd testing was the main foundation of successful dairy farming. Further proof of that contention has just come to hand from the South Taranaki Association, and it reveals a success of which any association in the world might be justly proud.

Not so many years ago an occasional average record of 300 lb. butterfat per cow was considered a wonderful result; but the South Taranaki Association has been aiming at an average of all cows tested within its bounds of 300 lb. It was a great object, thought by many to be unattainable, but it was successfully attained last season. The result is all the more remarkable for the reason that a fair number of cows did not yield a great deal more than 200 lb. of butterfat each.

Herd testing is a fruitful source of many desirable changes in dairy farm management, not the least important being the stimulation of the competitive spirit. Great results from one association spur others to make greater efforts, and, hence, are a source of all-round improvement. A general improvement in herd treatment is brought about, as it is soon realised that an increase in the herd average yield is not possible except there is first a general improvement in the management of the herd. It necessitates greater care in breeding, feeding, culling, sheltering, pasture topdressing and general pasture management.

Unfortunately the prospect of quotas or other restrictions on the export of butter, cheese, and by-products of the dairy farm may cause great discouragement to many farmers, and induce them to conclude that higher butterfat averages are of little value when the increase cannot be marketed. That such a conclusion is wrong should be obvious; indeed, the effort to bring about a higher average production should be intensified, not to increase the quantity of produce for export, but to enable farmers to decrease the number of cows in their herds very considerably, so that part of the land would be available for some other branch of farming; or, in other words, so that twenty cows would produce the quantity of butterfat that is now produced by twenty-five to thirty.—Primrose McConnell in the "New Zealand Farmer."

Cultivation of Maize.

In the production of maize the cultivation of the growing crop is essential for two main reasons—firstly, for the destruction of weeds, and, secondly, for the conservation of soil moisture. Harrowing the young crop is the first necessity, as it destroys young weed growth, particularly in the rows, aerates, warms and mulches the soil, and gives the young plants a quick start. As the crop grows it should be inter-row cultivated whenever weeds appear or the soil becomes crusted.

The depth of cultivation is very important. Cultivation of the established plants must not be too deep. No harm is done if deep cultivation is practised in the early stages of growth, provided it is not too close to the plants, but from when the plants are 18 to 20 inches high only shallow cultivation should be given, as, the plant being a surface feeder, the roots extend across the rows and within 3 or 4 inches of the surface.

The disadvantages of hilling outweigh the advantages, and as a general practice it cannot be recommended. A light hilling may sometimes be necessary to smother weed growth or as an aid to drainage on low-lying lands, but the damage done to roots, the possibility of "gullying" on slopes, and the greater surface exposed for evaporation are all against the practice, while the support given to the stalks by hilling is not so important as is usually thought. Throwing a big hill with the plough as still often practised cannot be too strongly condemned.

It is not necessary to remove the suckers from growing maize crops. This practice, adopted by many farmers with the idea of increasing yield and incidentally providing a little fodder for stock, actually decreases the yield, as proved in an experiment conducted at Grafton Experiment Farm (New South Wales) over a period of four years.

Safe Working of Farm Machinery—Some Vital Safeguards.

An accident which occurred recently to a young girl, whilst she was attending a power-driven separator on her father's farm, draws attention to the necessity for the adequate protection of milking machinery. This girl was partly scalped through her hair, which she was wearing long, being caught up by a belt, only 1 in. wide, transmitting power to the separator. In another case, it was found necessary to amputate the left leg of a man who had been caught in the belting of a milking machine.

Moving belts are responsible for most of the accidents with milking machinery. Often the victim is struck by the projections on metal belt fasteners, or is trapped at the intake of the belt with the pulley.

All belting within reach from the floor should be fenced. The habit of shifting belts by hand is dangerous. The use of a belt pole or stick is less dangerous, but mechanical means for shifting the belt are the safer. If metallic fasteners without dangerous projections cannot be obtained, the most convenient, and at the same time, a safe fastening, is a well-made leather-laced joint. Perches or hangers should be provided for belts in order to prevent them riding on the shaft when they are unshipped.

Another hazard of milking machinery is revolving shafting. Whilst shafting accidents are not so frequent as belting accidents, they are the more serious, and several fatalities and serious accidents have occurred. Many people are deceived by revolving shafting because it looks so smooth. However smooth it is it is capable of catching up anything loose, such as, for instance, aprons, ragged sleeves, hair, cleaning waste, &c. The hazard of revolving shafting is greater at higher speeds, but fatal accidents have occurred at shafts running at a few revolutions per minute. All exposed shafting, or shaft ends, should be protected, and projecting key heads in couplings and pulleys, projecting bolt heads and nuts in couplings, projecting set screws on shaft collars, and all other projections liable to catch in clothing should be eliminated or protected, unless they are out of reach and, therefore, safe by position. No shafting is considered safe by position, unless it is at least 6½ ft. above the floor, or from any point to which persons may have access whilst the shaft is in motion. The arms of wheels and pulleys within reach should also be fenced, or fitted with solid discs. Gear wheels should be encased in metal guards; partial guards are inadequate and may be dangerous.

There appears to be a general impression that, as all small farming machinery is exempt from inspection under the Inspection of Machinery Act, the owner is not legally obliged to guard it. This impression is quite erroneous. Any owner of power-driven milking machinery who permits any moving part of it to be used without being so guarded as to afford adequate protection to all persons working the machinery, or who may be in the vicinity thereof, is liable to a fine not exceeding twenty pounds. Further, an Inspector of Machinery has power to require the owner to desist from working or using any milking machine which is defective, or insufficiently fenced or guarded, until the requirement of his Department have been complied with.

If farmers wish to be completely successful in the prevention of accidents, it is necessary that they should supplement the provision of mechanical safeguards with a strict enforcement of certain rules of safe practices in the working of machinery. Some of the most important of these rules are:—

1. Never reach into moving machinery.
2. Stop the machine if it is necessary to approach any moving part which is not guarded or fenced.
3. Do not ship or unship moving belts directly by hand.
4. Do not permit loose belts to rest on revolving shafting.
5. Do not oil bearings in the vicinity of unfenced belts, shafting, or gear wheels, when the machinery is running.
6. Do not clean shafting, examine, or repair machinery when it is in motion.
7. Wear safe garments when attending moving machinery. A single-piece, close-fitting suit of overalls is safer than overalls consisting of separate coat and trousers. Pockets should be few and small, and sleeves should be tight at the wrist. If sleeves are not desired, they should be removed at the shoulder, or at the place to which they would be rolled up. If removed, the edges should be hemmed. Sleeves should not be worn rolled up because they then offer considerable resistance if caught in machinery. Do not wear loose or ragged clothing; nor loose aprons; neckties, if worn, should be enclosed.
8. Insist on any woman or girl working at milking machinery having her hair put up or enclosed in a net.
9. Never allow children to enter the shed in which the milking machinery is installed. Keep the door locked and the key out of their reach.
10. Even though the machine may be a small one, do not be careless when attending it.

The above precautions are, in the light of present-day experience, essential if accidents are to be prevented. The accident hazard of farm machinery is greater than it is generally supposed to be. A "safety first" policy will pay financially and socially. A moment for safety is better than a month in bed for repairs.—The "New Zealand Farmer."

Importance of a Good Bull.

A sire of unquestionable quality is essential if dairying is to be carried on with maximum profit. Referring in the course of his report, a judge of a recent North Coast (N.S.W.) dairy farm competition observed:—The herds seen were generally of a high standard as regards quality and type. It is very disappointing, however, to see so many farmers using herd sires which have no direct production backing. This requirement has been given publicity and advocated for so long that failure to observe it cannot be a matter of ignorance, yet the dairy farmer who places at the head of his herd a sire from untested stock is deliberately taking a thousand-to-one chance of his being able to improve the herd's average butter production.

Some farmers in the competition have carefully culled and tested their herds for years, bringing them to a fairly high standard, and then purchased a pure-bred bull from an untested dam, thus risking the work and expense of years. To "breed, weed, and feed" is an old slogan in the dairying industry, but no two of these three practices are of their full value without the other one.

How to Renew Old Cultivator Points.

Do not throw away your old cultivator points, for with a little attention they can be made as good as new again, a correspondent advises fellow-farmers in the "Agricultural Gazette" of New South Wales. Put them in the forge, heat to a nearly white heat, flatten out portion of the turned-up parts, and cut sides down to a V-shape. Then sharpen (by hammering) the cutting edges, like a wood-chisel, heat in the fire until a *slight* tinge of red appears in the steel, then immerse in sump oil for about half a minute and throw out to cool. This will give just the right temper—tough and hard. For very worn points, punch a new hole near one end, and they will be nearly as good as new.

Make your own cultivator points from old discs; there is nothing better, and they will outlast two sets of bought ones.

How to Cut a Rafter.

Many a farmer, in building any of the various small farm buildings, has no difficulty until he comes to laying out the rafters. Yet this is not a very hard matter once one takes a little time to think the problem through.

First, we should get clearly in mind the parts of the rafter. The first illustration herewith will make this clear. The plumb cut is where the two rafters meet at the peak of the roof. The seat cut is where the rafter rests on the wall plate. The plumb cut is always vertical, the seat cut is always horizontal.

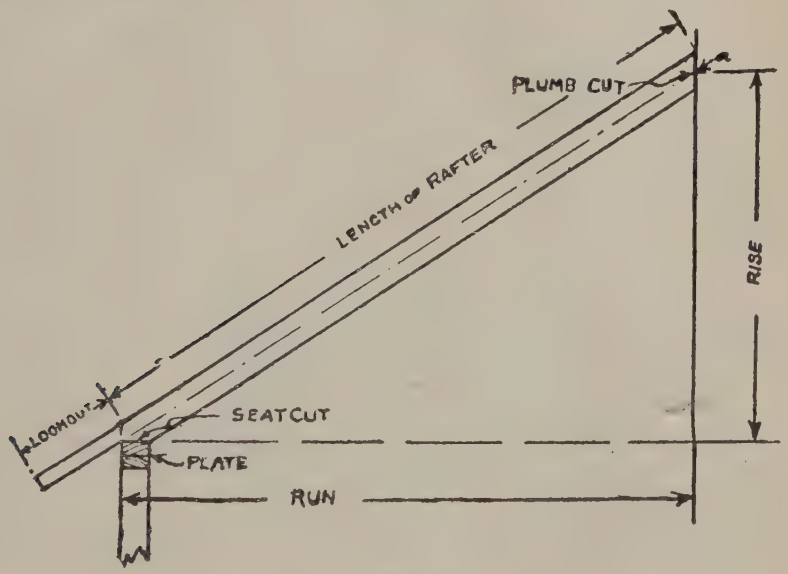

PLATE 277.

The run is the horizontal distance under the rafter, while the rise is the vertical height from the plate line to the point where the dotted line which touches the outside corner of the plate passes at "A" through the plumb cut. The run is half the width of the frame of the building. The term "length of rafter" refers to that part which covers the building, while the lookout is that part which projects beyond the side of the building.

Let us now take a practical problem and lay out a common rafter. All that is necessary is a steel square and a sharp pencil. Suppose we are building a garage 12 feet wide and want to use a ⅓ pitch roof. The rise of the rafter will be ⅓ of 12, or 4 feet, and the run will be 6 feet. If the rise is 4 feet, or 48 inches, for a 6-foot run it will be ⅙ of 48, or 8 inches for each foot of run. This, then, gives us the figures for applying our steel square to the 2 by 4 rafter. First lay off the plumb cut by placing the square on the 2 by 4 so the 8-inch and 12-inch division are in line with the upper edge of the rafter, as shown in "A" in the first sketch. Then make a fine mark at the 12-inch division and transfer the square so the 8-inch division coincides with the first 12-inch mark made on the rafter. Make as many

transfers as there are feet in the run, and the last 12-inch pencil mark will be directly above the outer edge of the studding. Now slide the square farther down, keeping the 8 and 12-inch divisions on the upper edge of the rafter, and mark off the seat cut to the desired depth.

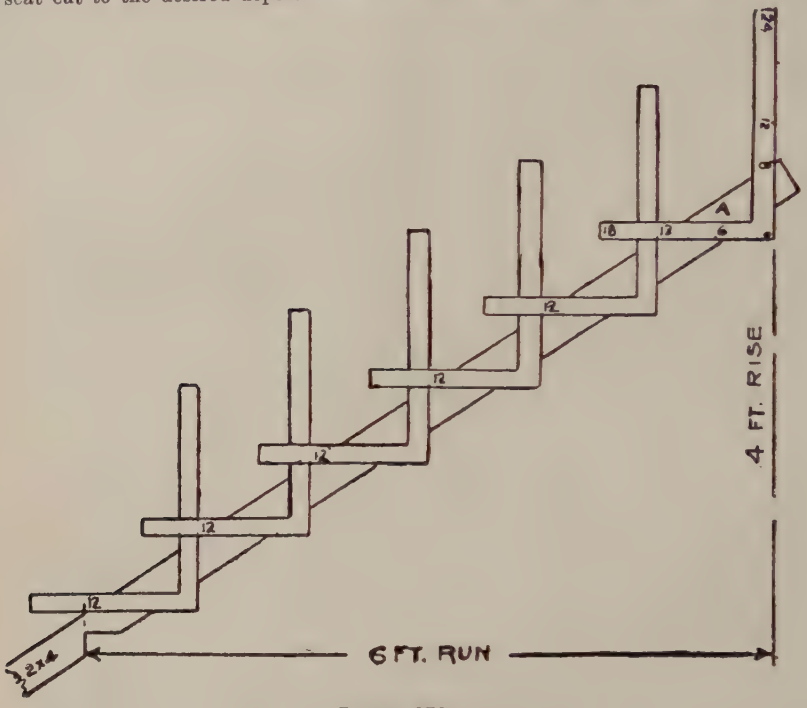

PLATE 278.

The transfers and marks must be very carefully made to get accurate results. Also choose 2 by 4 that is absolutely straight. After carefully sawing out one rafter, it can be used as a pattern for the rest.—"Farm and Ranch."

The Australian Nut—Method of Roasting.

The Australian nut is becoming deservedly popular, but with some types there is a difficulty in breaking the tough shell, and an even greater demand may be anticipated for this nut when the shelled kernels are more widely marketed, either fresh or roasted.

When roasting, the nuts must be fully matured if the best results are to be obtained. The kernels containing the highest oil content give a better-flavoured product than those with a low percentage of oil. The latter are liable to darken or char during the roasting process.

To determine which nuts are suitable for roasting, the specific gravity of the kernels is roughly tested. The dividing line is around a specific gravity of 1; kernels with a specific gravity of less than this have a higher oil content, and contain less sugar. The fresh flavour of the two types is quite distinct. Generally speaking, the smooth-shelled nut has more oil and less sugar than the rough-shelled nut, and it is a more desirable type to grow.

Some trees produce nuts that have bitter kernels. Care should be taken that these are not included in the nuts offered for sale.

The kernels are air-dried in the shell before the nuts are cracked; they are then dried at a temperature of 175 degrees Fahr. for four hours in an oven through which a fair draught of air is continually passing. The kernels are then roasted for forty-five minutes at a temperature of 270 degrees Fahr., and allowed to cool, and gum arabic (10 grammes to 100 c.c. water) is applied. Salt is sprinkled over the kernels, which are then finally dried for a short while at 150 degrees Fahr.

To cook the kernels in vegetable oils, first dry as described, and then cook in the vegetable oil for fifteen minutes at 280 degrees Fahr.—A. and P. Notes, N.S.W. Department of Agriculture.

Cementing a Worn Tank.

A lasting method of repairing corroded iron tanks is to coat them with cement "compo." The method described will be found efficient, and the resultant tank will be strong, rust-proof, and indestructable. The tank must be thoroughly cleaned of all mud and foreign matter both inside and out. Holes are punched in the walls.

PLATE 279.

These holes should be approximately half an inch in diameter and spaced about 12 inches apart. Small mesh wire netting of half-inch mesh and 22-gauge is then lapped around the tank both inside and outside, the layer for the bottom overlapping on the walls about 6 inches, both layers being laced through the holes, using fine tie wire. In the case of a large tank, the bottom must be plastered first, overlapping the walls about 6 inches, and allowing to harden so as to provide a foothold when plastering the walls. Before plastering, the tank is treated with a neat cement wash, thrown on to the surface by means of a brush. This is to

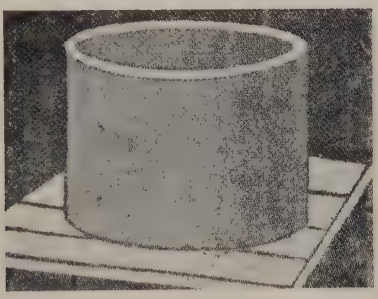

PLATE 280.—CEMENTED TANK.

provide a bond between the tank and the plaster. Now mix a mortar of one part cement to two parts fine clean sand with only enough water to form a stiff but workable mix. Apply in thicknesses of ½-in. When almost hard, score surface to provide bond for next coat. Allow each coat to harden, then damp cure for two days. Thoroughly moisten each coat before application of succeeding coat. Cure finished work for seven days before using. The finished tank combines a neat appearance with strength and utility.

A tank of 6 feet in diameter, 6 feet deep, having a capacity of 1,060 gallons before treatment, would have its capacity reduced to 970 gallons after repair to concrete walls and bottom 2 inches in thickness. Quantities of material required would be 11 cubic feet of cement and 22 cubic feet of sand. A paper bag of cement contains 1¼ cubic feet. A tank 12 feet in diameter, 6 feet deep, having an original capacity of 4,230 gallons, would require a 3-inch cement wall and bottom. Its capacity when repaired would be 3,880 gallons. Materials required: 39 cubic feet of cement and 79 cubic feet of sand.

Feeding for Butter-fat Production—No Grass or Legume "Best."

Each component of the mixed pasture which is desirable for the feeding of dairy cows has its value, and it would be invidious to speak of any grass or legume as "best," points out an article in the "Agricultural Gazette" of New South Wales.

In indicating the impossibility of accurately compiling such information, attention is called to the fact that the percentage of butter-fat in the milk of any animal depends to a far greater degree on the inherent ability of the particular breed or strain to give high-quality milk than on the quality of feed given. Any increase in butter-fat production would be due to increased quantity of milk produced, and not to improved quality.

Moreover, the effect of any particular plant on the nutritive ratio and nutritive value of other plants with which it is likely to be found in association must also be borne in mind. Whereas, for example, a roughage and a concentrate in certain proportions may form an excellent milk-producing diet, yet it cannot be stated that one or the other has superior value, since each would prove unsatisfactory if fed alone. Thus it is only possible to indicate in a general way which plants possess high nutritional values and to indicate in what proportions admixture is desirable.

Referring to the grasses usually recommended for parts of the North Coast (N.S.W.), namely, paspalum, perennial rye grass, cocksfoot, *Phalaris tuberosa*, tall oat, prairie and Italian rye grass, it was pointed out that at similar stages of growth all were practically of equal feeding value.

Paspalum as a sole item of diet is lacking in both protein and phosphorus, but it can nevertheless be an excellent pasture plant when growing in conjunction with white clover, red clover, subterranean clover, trefoils, or other luguminous plants rich in those constituents lacking in paspalum. Such grasses as the spear, wire, Parramatta, and carpet are quite definitely undesirable, due to high fibre content and low digestibility and protein content.

In regard to the legumes, the best plan to adopt is to utilise those which succeed best in the particular area under consideration, since all legumes are high in protein, lime, and phosphorus content. Presuming that good methods of pasture management are used, a suitable proportion is approximately 65 per cent. of high-quality grasses and 35 per cent. of legumes.

Management is such an important factor controlling pasture value that it must be as carefully considered as the species present. In the case of all plants used for grazing purposes, it has been found both by analytical methods and by field experience that after the plant has passed a certain stage of growth its value as feed declines rapidly, till at maturity it is far below the earlier level. For example, at Berry Experiment Farm (N.S.W.) cuts taken when the young pasturage was 4 inches high and cuts of mature (flowering) pasture of the same botanical composition gave chemical analyses as follows:—

—	Immature Pasturage.	Mature Pasturage.	Percentage increase of immature over mature Pasturage.
	Per cent.	Per cent.	Per cent.
Protein	10·481	8·044	30·3
Lime (CaO)	·428	·337	27·0
Phosphoric Acid (P_2O_5) ..	·474	·446	6·3

These figures are from a good pasture. Where undesirable species are present the effect is much more marked, due to the high fibre content of the mature plants.

Hence, whereas a pasture when 4 inches high may be quite ideal in its feeding qualities, precisely the same botanical mixture is likely to be too low in protein content when allowed to reach maturity. The inferior value of tall, rank paspalum compared with a short, quickly-growing cover of the same grass is well known.

Thus, to increase milk yield and with it the butter-fat yield, it is vital that the farmer adopt such a system of management as to keep his stock continuously on young pasturage. This can be achieved satisfactorily only by subdivision of the paddocks to such a size as to permit a system of rotational grazing with brief but heavy stocking of the paddocks successively.

The Prayer of the Horse.

"To thee, my master, I offer my prayer.

"Feed me, water, and care for me, and when the day's work is done provide me with a shelter and a stall wide enough for me to lie down. Talk to me. Your voice often means as much to me as the reins.

"Do not whip me when going uphill. Don't beat or kick me when I do not understand what you mean, but give me a chance to understand you. Watch me, and if I fail to do your bidding see if something is not wrong with my harness or feet.

"Examine my teeth when I do not eat. I may have an ulcerated tooth, and that, you know, is very painful. Do not tie my head in an unnatural position, or take away my best defence against flies and mosquitoes by cutting off my tail.

"And finally, oh my master, when my useful strength is gone, do not turn me out to starve or sell me to some cruel owner to be worked and starved to death; but do thou, my master, end my life in the kindest way. You may not consider me irreverent if I ask this in the name of Him who was born in a stable. (Translated from the Arabic.)

A Dozen "Don'ts" for Horse Drivers.

Extract from the Annual Report of the Queensland Society for the Prevention of Cruelty:—

Don't fail to rug your horse when he stands in the cold.

Don't forget that ills often result from exposure and chill which follows suddenly checked sweating.

Don't fail to keep your horse well shod.

Don't work a lame horse or you may make a temporary injury a permanent one.

Don't let any alleged blacksmith lame your horse. Do you cut your own feet down to fit your boots? Well, don't forget that your horse's shoes should be shaped to fit his feet, and not his feet shaped to fit his shoes.

Don't load your horse too heavily, especially when the streets and roads are wet and slippery.

Don't force him to back a heavy load over a slippery road or up-hill.

Don't fail to grease your waggon axles. There is a heap of humanity in wagon grease.

Don't put badly-fitting harness on your horse.

Don't forget that there is more profit in coaxing a horse than in kicking him.

Don't thrash your horse if he jibs. Lift his collar and wipe it and his shoulder, and let the air at them; then tie your whip thong round his foreleg just below the knee and pull his leg forward to start him. Try it.

Don't illtreat your horse, or you may have to answer to the court for it.

A New Hen—The Cambar.

Queensland poultry raisers will be interested in this note on the evolution of new breed—the Cambar—by a writer in the "Spectator" (London), for 13th July, 1934. Few successes of greater interest or more prospect of practical value have been won in the field of agricultural biology than the making of the new Cambridge hen. Mr. Punnet and his fellow Mendelians at Cambridge have put into their new breed exactly the virtues they desired, and such precise control is comparable with the achievements of the plant breeders. The first Cambar, as the new breed was christened, was "invented" for the sake of possessing a pure-bred hen whose chicks would declare their sex at birth. It is, of course, an immense advantage to the industry to be able to distinguish day-old chicks, for the reason that they travel safely and well only during the first two days of their life; and the trade in day-old chicks becomes very large. This was the first success. Since then a silver as well as a gold Cambar has come into being; and by the use of the Canadian Barred Plymouth Rock (supplied by the University of British Columbia to Cambridge University) the new breed is becoming prolific and a great layer of large coloured eggs without letting go the virtue of "sex-linked" chicks. I saw six of them of one hatching last week; and the babes are as distinct in uniform as their parents. No one could fail to distinguish hen and cock. The birds mark an epoch in scientific breeding applied to practical purposes.

Queensland Co-operative Bacon Association.

At the annual meeting of the Queensland Co-operative Bacon Association, Ltd., Mr. James A. Heading, chairman of directors, presided, and, in moving the adoption of the report and balance-sheet, he said the operations had been conducted at a profit. The average price paid for pigs for the whole year was over one half-penny per lb. better than last year, and higher than since 1930. A total of 53,350 pigs had been received, an increase of 11,121. The numbers, however, were not nearly up to the requirements or capacity. The question of greatest moment at present was the need of greatly increased supplies.

Sales for the year were £178,576, an increase of £38,860. All branches of the selling organisation contributed to this increase. The quality of "Atlas" products had been consistently maintained, and this had been very helpful in increasing the demand.

The Sydney branch had another successful year, sales there being £51,071. The association now had 5,025 shareholders.

Negotiations for the amalgamation of the two co-operative bacon associations were still in progress, but it appeared most unlikely that they could be brought to fruition. In connection with the amalgamation proposals an independent valuation of the assets of the association had been made, and Messrs. Robinson and Jolly had certified that the assets were considerably in excess of book values. The election of directors resulted:—Burnett and Mary Valley, Mr. J. A. Heading (returned unopposed); West Moreton, Mr. G. Setch (returned unopposed); South Burnett and Brisbane Valley, Mr. G. E. J. Chaseling, 166; Mr. J. T. Mulcahy, 140. Mr. W. H. F. Buchanan was re-elected auditor. Chairman's allowance and the directors' and auditor's fees were fixed at the same as last year. Shareholders present expressed keen appreciation of the progress of the association.

Composition of Milk—Causes of Variation.

The average composition of pure cow's milk under New South Wales conditions is 86.88 per cent. water, 4.0 per cent. fat, 3.32 per cent. casein, .39 per cent. albumen, 4.67 per cent. milk sugar, and .74 per cent. ash, but variation may be caused by any of the following causes or any combination of them:—

1. The cow—its breed, its individuality, health, and condition.
2. The period of lactation.
3. Time of milking—morning or evening.
4. The part of the milk tested (whether first part or the strippings).
5. The food and water consumed by the cow.

Fat is a normal constituent of cow's milk, usually ranging on a percentage basis from 2.8 to 6.5 per cent., but varying (*a*) with the breed, and (*b*) with individuals of the same breed. The following table shows the range and the average of the butter-fat content of the milk of New South Wales cows of the different breeds:—

Breed.	Range.	Average.
	per cent.	per cent.
Australian Illawarra Shorthorn	2·8 to 5	4·0
Jersey	4·2 to 6·5	5·0
Guernsey		
Ayrshire	2·8 to 4·6	3·8
Friesian		

Several factors influence the variation in the fat content of milk given by the same cow. The more important of these are temperament, climate, physical condition, breed, and feed.

Temperament.—The cow is a very nervous animal, and harsh treatment easily upsets her. Often the better the breeding and the greater the production the more highly strung she is. Beating, scolding, and using dogs are some of the practices that should not be tolerated in a milking yard. Not only will the quantity of milk given decrease considerably from such treatment, but the fat content will likewise diminish. It has been noted frequently that a test has dropped 1 to 1.5 per cent., and the milk weight 30 to 50 per cent.

Climate.—Food given a cow serves the double purpose of providing (*a*) heat and nourishment of the body, and (*b*) milk. If the animal is well sheltered and rugged during very cold weather, a greater portion of the food eaten is used for milk production. Official records repeatedly show that during or immediately subsequent to cold, windy, wet weather the yields of cows not properly cared for in the way of shelter and warmth have been appreciably lowered.

Physical Condition.—Cows, like all other animals, have their periods of sickness, or they may be merely what we term "off colour." Digestion may be faulty or there may be some slight physical ailment, or something more serious, like abortion. The more frequent cause of variation in milk weight and fat content is from being in season. At such a time milk production is never normal.

Breeding.—The fat content of milk is to a great extent a question of inheritance. Different breeds are noted for high, medium, or lower percentage of fat. Jerseys, for instance, have long been noted for a high percentage. Friesians had in the past a name for great volume, but with a low fat content. Recently, however, this breed is proving by records that the average fat percentage has been and is being increased. The Australian Illawarra Shorthorns are proving the same thing. Thus it is evident that the capacity to give a milk rich in fat can be bred into any breed of cows by careful selection in a comparatively short period of time. This would not be done in one or two generations, but experience shows that a gradual improvement can be made.

Feeding.—A cow inherits fat-producing capacity (*a*) on account of her breed, and (*b*) individually, as a result of breeding. This might be termed her maximum capacity. She can, by careful treatment and proper feeding, and if everything is in her favour, reach this maximum, but not exceed it. Even to reach it too great a strain might be necessary on her constitution for too long a time, to her permanent injury.

The first essential to giving a cow a chance to show what she can do in the way of production is to have had her sire in good health and condition when serving her dam, and more important still is that the dam should have been in good condition at time of calving. The heifer when born needs the best of attention as regards feeding and housing during the first six months of her life, especially during the first two. If a cow has been well born and well reared her records for production in after life depend to a great extent on feeding.

She should not be starved during the three or four months preceding freshening, and after calving she should be well and regularly fed. Both under-feeding and over-feeding are undesirable; too rich a ration (one containing too great a proportion of concentrates) and a ration of grainless wheat straw are both to be avoided. The digestive organs of a cow should not be out of order if she is to give good results. The cow's test will vary according to her feeding, but is limited by her inherited maximum.

During droughts, when stock are nore than half-starved, the fat content of their milk is lowered. This has been demonstrated by the official records obtained from both Government and private herds. Again, during the spring season, when the pastures are soft and young, while the quantity of milk given increases, the fat percentage is lowered.—A. and P. Notes, N.S.W. Dept. Agric.

Buying Better Boars—Assistance to Settlers.

The Better Boar Subsidy Refund Scheme in operation over the period August, 1933, to 30th July, 1934, attracted considerable attention throughout Queensland and resulted in a wide distribution of pedigreed boars in the Large and Middle White breeds, and in increased interest in the development of more extensive outlets for Queensland pork in the markets of the United Kingdom.

Boars were distributed to numerous centres in the Western, far Northern, and Central areas; to the South, Central, and Upper Burnett; North and South Coast and branch lines. This scheme terminated on 30th June, 1934, and has been replaced by a scheme fostered by the Rural Assistance Board of the Agricultural Bank. Under this scheme the Board, acting in co-operation with the Agricultural Bank and Department of Agriculture and Stock, advances on loan 50 per cent. of the landed cost of boars, four months to two years of age, in the following breeds:—Large White, Middle White, Tamworth, and Berkshire.

Forms of application are now available and may be obtained by writing to the Department of Agriculture and Stock, Brisbane, or to the Agricultural Bank. The loan is repayable on easy terms over a period of two years, subject to satisfactory arrangements being completed on receipt of the application form properly completed and accompanied by a fee of 5s. payable to the Rural Assistance Board, Agricultural Bank, Brisbane.

Points for the Pig Raiser.

A question that often crops up in the judging of pork and bacon pigs at agricultural shows is as to whether the sow will make up into better bacon than the barrow. The answer to such a question takes into consideration two phases. Sow pigs, particularly in warm climates, come in season very early and one often notices sows awaiting slaughter that show distinct evidence of the oestral period (or of being on heat or in season). If slaughtered while in the feverish condition that accompanies the oestral period the meat will not set well nor will it be as mellow as is desirable in the finished form.

On the other hand sow pigs produce a larger proportion of first grade lean meat than barrows, for sows are lighter in back fat and are thicker in the streak of lean meat running along the sides than is the case with males; on the other hand there is less risk with barrow pigs, although it must be remembered that improper castration often results in the formation of deep-seated abscesses in the area of the scrotal sac and many a good pen of barrow baconers has suffered at the hands of the judge who is discriminating and takes a special care to examine that portion of the body before giving his decision. Perhaps after all, sow pigs do make the best bacon, but on the average so much depends on breeding, type, feeding, and handling that the matter of sex is virtually an unimportant one, and further the farmer has no control over the sex of his pigs, so must make the best use possible of both boars and sows.

Is Salt a Tonic or an Appetiser.—Visiting a well-known Brisbane stud piggery recently, it was noticed that the man in charge of the pigs kept a bag of coarse salt (usually known as pickling salt) close to the feed boiler. When asked if he used salt in the food he replied that he regularly added a handful of salt to the food when preparing same for cooking, for he had noted over a series of years that the pigs always made better growth and had better appetites when a little salt was added to their food.

The quantities used would, of course, be important, and should not exceed, say, one half teaspoonful per pig per day; salt has a good food value, and is a necessity in all rations, but care must be taken not to force the pigs to consume too much, and the water in which corned beef or ham has been boiled should on no account be used unless distributed over a large quantity of food, for salt can become a poison just as it is a necessity. Charcoal, wood ashes, and bone meal are further additions, so also is a cup full of lime water added to the pig's food occasionally.

The careful farmer watches all these points and sees to it that his pigs do not suffer as a result of a deficiency in mineral matters.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Controlled Grazing of Pastures.

Conditions vary so much in different districts, and even on the same property, that no hard-and-fast rules can be laid down with regard to the subdivision of paddocks, observes a departmental pamphlet on pasture management. The aim should be to provide sufficient paddocks to control the grazing completely, so that an even growth can be maintained in each. With controlled stocking the pastures can be fed off when at their maximum feeding value, i.e., when they are providing short, succulent growth high in protein content, and there is no waste such as is associated with more mature but less palatable and less nutritious growth.

Paddocks that are too large result in stock having to travel long distances for food and water, which is particularly undesirable for fattening or milking stock, as much of the food consumed is then used to supply energy for unnecessary walking. This point is of importance to those contemplating fat-lamb raising or the production of early-maturing beef. Large paddocks are also responsible for a certain amount of erosion, as the animals in their search for food tend to traverse definite tracks, which become bare of grasses. In hilly country these bare tracks form channels along which water flows, finally resulting in erosion.

The expenditure entailed in laying down large areas of sown pastures on well-prepared land is considerable, and although returns amply justify the outlay, some pastoralists have not the capital available for this work on a large scale. By choosing the most suitable soils and situations, however, it is remarkable what excellent results can be obtained from small areas of sown pastures when used in conjunction with larger areas of natural pastures, and graziers with limited capital should proceed on these lines.

Creek-frontage country properly subdivided, with the land well prepared and sown down to mixtures of grasses and clovers or lucerne, is particularly suitable for this purpose. These areas should be subdivided and fenced so that stocking can be regulated and the stock given access both to the sown and natural pastures; it should always be possible to close up the sown pasture when necessary. It may be thought that where stock have ready access to sown pastures they will concentrate on these and neglect the natural pastures. In practice, however, this is seldom the case, as a certain amount of rough feed is essential and the stock will obtain this from the natural grasses.

By adopting this system stock can be left in the paddocks for longer periods than would be the case with small paddocks of sown pastures, and then can be kept off the sown pastures in the event of over-grazing on these areas. It may also be desirable to save the sown pasture at times in order to ensure a supply of winter feed or succulent pasture for lambing ewes, sick animals, or for "topping off." When working on these lines, the movements of stock can be regulated to some extent by top-dressing. It is not sound practice, for example, to top-dress the small area of improved pasture and leave the natural pasture unmanured, as this tends to encourage grazing on the improved section. By top-dressing the natural pasture, the palatability and nutritive value are increased and the tendency is for the stock to utilise these pastures in conjunction with the sown pasture.

A system similar to the above is also desirable with grazing lucerne, as a balanced ration is provided, and the stock can be quickly moved on to the grass in the event of hoven, although liability to this trouble is decreased by the practice.

When arranging the disposition of watering-places, stock licks, &c., consideration should be paid to the well-being of the pastures, and these so placed as to avoid concentration of grazing on small patches as far as possible.

Top-dressing, particularly on herbage country, frequently results in a pasture composed almost entirely of clovers for a period, and where this occurs stock should have access to grass paddocks where the percentage of clover is small.—A. and P. Notes, N.S.W. Dept. of Agri.

PLATE 281.—TYPES OF SOUTHERN QUEENSLAND PORKERS.

[Block by courtesy of the Queensland Meat Industry Board.

PLATE 282.—BEEF CHAMPIONS, BRISBANE SHOW, 1934.

[*Block by courtesy of the Queensland Meat Industry Board.*

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

ECONOMICAL DIETS.

In November, 1933, there was published a valuable report of a special committee appointed by the Council of the British Medical Association "to determine the minimum weekly expenditure on foodstuffs, which must be incurred by families of various size, if health and working capacity are to be maintained, and to construct specimen diets." Food prices in Queensland are very different from those in Great Britain, and it would be impossible for us to accept the diets proposed without modification; but by adopting the data given in this report, and by following the same methods of calculation, it is possible to construct sample diets, which should be useful to those Queensland mothers who are compelled to exercise great economy, and should enable them to spend their small weekly allowance in such a way that the nutrition of their families should not suffer.

Requirements of the Diet.

It is obvious that a man weighing 9 stone engaged in a sedentary occupation can maintain his health and working capacity on less food than is necessary for a man weighing 13 stone, who is doing daily hard muscular work. We are compelled to strike an average, and allowance will have to be made for individuals who depart largely from that average. The diets given are calculated for an average man not engaged in strenuous manual labour. It must provide sufficient food to maintain health and weight, and food of suitable kind. That is, it must be of adequate energy value, must contain an adequate quantity of proteins (body-building foods), carbo-hydrates (starches and sugars), and fats. It must also contain a liberal supply of vitamins, a most important point, in which many common diets fail lamentably. Finally, it must provide sufficient variety, so that there is no deadly monotony in the diet.

Methods of Calculation.

The energy value of a diet is calculated in units which are called calories. The official scale in Great Britain has been 3,000 calories per man daily. For several good reasons the committee has adopted a higher scale of 3,400 calories. The requirements in proteins are placed at a weight of 100 grams, of which one-half should be animal proteins. Those of fats also at about 100 grams, of carbo-hydrates 500 grams. The contents of proteins, fats, and carbo-hydrates in all common foods have been ascertained by analysis; the vitamins cannot be determined quantitatively, but in the diets constructed they are abundantly present.

Sample Weekly Diets.

	Man, wife, one child between 3 and 6.		Man, wife, three children; one between 6 and 8, one between 8 and 12, one between 12 and 14.	
	Quantity.	Price.	Quantity,	Price.
		s. d.		*s. d.*
Beef and mutton (cheaper cuts)	4½ lb.	1 1½	10 lb.	2 6
Liver, heart, kidneys, &c.	2 lb.	0 6	3 lb.	0 9
Eggs	..	..	4	0 4
Cheese	½ lb.	0 6	½ lb.	0 6
Milk	10½ pints	2 7½	14 pints	3 6
Butter	1 lb.	1 4	1½ lb.	2 0
Dripping	1 lb.	0 4	1½ lb.	0 6
Flour	4 lb.	0 6	6 lb.	0 9
Cooking Bran	..	¼	..	0 0½
Bread	13½ lb.	3 4½	27 lb.	6 9
Sugar	3 lb.	1 0	5 lb.	1 8
Golden Syrup	..	..	1 lb.	0 3¼
Jam	1 lb.	0 4	1 lb.	0 4
Potatoes	8 lb.	0 9	14½ lb.	1 4
Dried peas or beans	½ lb.	0 2	1 lb.	0 4
Oatmeal	1 lb.	0 3	2 lb.	0 6
Wheatmeal	1 lb.	0 3	2 lb.	0 6
Rice	½ lb.	0 1½	..	..
Pearl Barley	..	..	½ lb.	0 1½
Tea	½ lb.	1 0½	½ lb.	1 0½
Salt, carbonate soda and cream of tartar	..	0 1½	..	0 2½
Fresh fruit and vegetables	..	2 0	..	3 0
Total	..	16 4¼	..	29 11¼

Man Values.

If the food requirements of a man be taken as one, that of other members of the family are calculated on the following scale:—

Ages.	Man-value.
Adult, man	1.00
Adult, woman	0.83
Child, 1 to 2 years	0.30
„ 2 to 3 years	0.40
„ 3 to 6 years	0.50
„ 6 to 8 years	0.60
„ 8 to 10 years	0.70
„ 10 to 12 years	0.80
„ 12 to 14 years	0.90
Persons over 65 years	0.75

To calculate diets for families of all sizes and ages is therefore possible. We shall content ourselves with two families only.

The first consists of man, wife, and one child between three and six years of age. By reference to the following table its man-value is found to be 2·35. The second family consists of man, wife, and three children, one between six and eight years, one between ten and twelve, one between twelve and fourteen. Its man-value is 4·13. We shall omit the calculations of the calories, proteins, carbo-hydrates, and fats of each article in the two diets, and merely give the totals.

In the first diet the calories are 3,454, the proteins 100·5 grams, of which 47·1 are animal proteins, the fats 106·1, the carbo-hydrates 493·0 per man per day. In the second diet the calories are 34·9, proteins 103·2, animal proteins 47·2, fats 108·4, carbo-hydrates 498·2. These calculations are not so precise as they seem, as some foods vary in composition. They are given to satisfy those who understand these matters. For most of our readers only the quantities and prices are of importance.

Remarks.

These diets are sufficiently varied and contain everything necessary for wholesome nutrition. Undoubtedly they might be made more varied and pleasing by spending a few more shillings, but as they stand they are better food than is consumed by many who spend twice as much. There is a prejudice against liver, but it is a more valuable food than beef-steak, and many like it disguised under the name "lamb's fry." One pint of milk per day is provided for the child under six, half a pint for the older children, one quarter pint for the adults. It would be better to have two or three pounds of butter, but for economy dripping has been substituted for half the butter, not margarine, which costs three times as much and is not a trustworthy food. Cooking bran is provided to supply a necessary vitamin, and its cost is negligible. Eggs should be bought only when cheap; when they are dear another half pound of cheese may be substituted. A fixed sum is provided for the purchase of fresh fruit and vegetables, to be expended at the discretion of the housewife. She is specially advised to buy tomatoes when they are cheap. Tea has no food value, but has become a necessity to many adults. Children do not need it and are better without it. At most they should have a mere pretence.

The prices are low (not always the lowest) Brisbane prices, but the prices of many things vary. We cannot give the prices elsewhere; our readers must find out for themselves.

IN THE FARM KITCHEN.

THE DIETETIC VALUE OF THE POTATO.

Subjoined are extracts from the address of Mr. A. J. PINN, Special Agricultural Instructor, at a recent New South Wales Agricultural Bureau Conference:—

The potato has always been regarded as an important vegetable in the diet of Australians. Its use in the diet has, in the past, not been dictated by any study of the dietetic value, but simply on account of its appeal to the palate, its relative cheapness as an article of food, its ease of preparation, or by habit acquired in the early home-training.

Owing to the fact that the *per capita* consumption of potatoes is decreasing, and in the light of recent dietetic investigations, it is necessary from a community health point of view that the general public be acquainted with facts relative to the health-giving tuber. With so many "Eat More" campaigns, and the advertised claims of various manufactured foods, it is also necessary that the consumer give serious consideration, not to bold statements made in advertisements, but to the true facts founded on scientific investigations. It is quite obvious that most persons cannot eat more of all the various foods advertised, so must therefore choose those which are at a cost within the limits of the purse, and at the same time provide the necessary requirements for the sustenance and healthy functioning of the body.

In order to obtain the full food value of the potato, it is essential that the housewife should know that the methods of cooking now commonly practised are wasteful. In the first place it must be realised that in the peeling of tubers much

of the nutrient value of the potato is lost, and for that reason it is suggested that the cooking in the skin should become more general. Baking the tubers is less wasteful of food values than boiling.

If it is desired to follow the old practice of first peeling the potatoes before boiling, it is desirable that the potatoes be not soaked in water, awaiting time to commence cooking. This practice allows of loss of food value, as also does the placing of the potatoes in cold water to bring them to the boil. If the peeled tubers are placed direct into boiling water, much less loss of food value results. Research by the Chemical Division of the Minnesota Agricultural Experiment Station has indicated that the loss of albumenous compounds was as follows:—

	Percentage loss.
(*a*) Peeled potatoes started in cold water	80
(*b*) Peeled potatoes started in hot water	10
(*c*) Potatoes, *not* peeled, started in cold water	50
(*d*) Potatoes, *not* peeled, started in hot water	2

The following extracts from the writings of Dr. J. H. Kellogg, Superintendent of the Battle Creek Sanatarium, Michigan, U.S.A., should be of interest, particularly in respect to the value of the potato as a health food.

The potato is truly a most remarkable product. It contains within its aseptic covering a rich store of one of the most easily digestible of all forms of starch. The observations of Mosse, Van Noorden and others have shown most conclusively that the starch of the potato is more easily digested and appropriated by the body than the starches of wheat, corn, and most other cereals. In laboratory tests made by the writer it was found that potato starch digested in less than one-sixth of the time of cereal starches.

"The potato is not only an easily digestible foodstuff but possesses much higher nutritive value than is generally supposed. According to Gautier, about one-fourth of the weight of the potato is food substance, consisting chiefly (nine-elevenths) of starch. Of the remainder, three-fifths are protein (the tissue-building element), and two-fifths alkaline salts in combination with citric and malic acids (acids of the lemon and the apple).

"The belief is quite general that the potato especially promotes fat-making, and hence that its use must be avoided by persons who have a tendency to obesity. This is also an error. All foods tend to produce obesity when taken in excessive quantity—that is, more than the individual needs to maintain his nutrition on equilibrium. No foods produce excess of fat when limited in quantity to actual daily bodily needs.

"As a matter of fact, the potato is deficient in fats, of which it contains almost none, because of the fact that it is not, like so many of our vegetable foods, a seed, but a curiously modified and enormously fleshy tuber. This deficiency in fat must always be remembered in the use of the potato, and the lack must be made up by the addition of cream, butter, or some other foodstuff rich in fat.

"The potato is of immense service as a food remedy in the treatment of a large number of diseases. It is especially valuable in cases of chronic intestinal auto-intoxication or 'biliousness.' It affords bulk for the intestine to act upon, and so antagonises constipation. The large proportion of starch and other carbohydrates encourages the growth of friendly bacteria in the intestine, thus preventing putrefaction. For the same reason the free use of potatoes combats rheumatism and gout, which are results of chronic intestinal poisoning.

"The potato is valuable in the treatment of anæmia, because it contains the growth in the intestine of the germs which produce blood-destroying poisons. The death rate from diabetes, according to the mortality statistics of the United States Census Bureau, has increased nearly 50 per cent. in ten years. The freer use of potatoes as an article of diet and the lessened consumption of meat would perhaps do more than any other one thing to suppress the alarming increase of this fatal malady.

"Arteriosclerosis, or hardening of the arteries, a disease which causes apoplexy, and is associated with Bright's disease and various forms of heart diseases, besides being the cause of premature old age, is most often directly the result of chronic poisoning, the source of which is the putrefaction of undigested remnants of animal substances which have been eaten, which undergo decay with the absorption of poisonous products. The free use of the potato as an article of diet in place of the excessive consumption of meat and fish, a practice widely prevalent, would unquestionably check the alarming rapid development of this disease, which, according

to the United States mortality reports, has increased 400 per cent. in the last ten years.

"The potato, butter-milk, and oatmeal diet of the Irish has developed one of the most sturdy and enduring races of men to be found anywhere. The proportion of centenarians in Ireland is more than ten times as great as in England. There can be no doubt that the free use of potatoes by the Irish is in a large measure responsible for the remarkable longevity of this nation.

"The potato more than any other single article of food is capable of rendering a notable service in conserving and prolonging human life. It is highly important that the public should be informed respecting the supreme dietetic value of the potato and instructed in its use. Every adult should eat at least 1 lb. of potatoes daily. It is to be remembered that the tuber is three-fourths water. Infants of six months may be given potato puree with benefit, especially as a protection against acidosis, which often manifests itself in children as cyclic vomiting.

"More potatoes and more milk, more green vegetables—spinach, lettuce and the like—with bran and fresh fruits to aid elimination; these are the nation's greatest dietetic needs."

RECIPES.

Baked Apple Dumplings.

Materials.—Four apples, 4 cloves, 4 teaspoonfuls sugar, 1 dessertspoonful butter, icing sugar, ¼ cup of water. For Pastry—4 oz. flour, 2 oz. lard or dripping, ¼ teaspoonful baking powder, pinch of salt, ¼ cup of water.

Utensils.—Knife, corer, board, baking tin, brush.

Method.—

1. Peel and remove cores from apples.
2. Put into centre of each apple, sugar, clove, and butter.
3. Make short pastry, cut it into four parts, knead each part into a circle.
4. Put an apple on each circle; work the circle up to cover the apple.
5. Put covered apples on a baking tin; brush over with sugar and water.
6. Bake in a moderate oven for 30 minutes or until apples are tender.
7. Sprinkle with icing sugar; serve with custard.

Chocolate Pudding.

Materials.—One cup bread crumbs, 1 egg; 1 cup milk; 1 dessertspoonful butter, 1 tablespoonful chopped nuts, 1 tablespoonful sugar, 1 dessertspoonful of cocoa.

Utensils.—Pie dish, whisk, spoon, saucepan, basin, cup.

Method.—

1. Attend to the oven.
2. Place milk on to boil; put bread into a basin.
3. Pour milk over bread and allow to stand covered for ten minutes.
4. Add cocoa or chocolate, sugar, nuts, butter, and beaten yolks of eggs.
5. Beat all well together.
6. Place in a greased pie dish and bake in moderate oven for three-quarters of an hour.
7. Decorate with well-beaten white of egg.
8. Return to oven and slightly brown.
9. If steamed, add the well-beaten white of eggs, fold in lightly, and place in greased basin and steam for one and a-quarter hours.
10. Serve with boiled custard or chocolate sauce.

Chocolate Sauce.

Materials.—One dessertspoonful arrowroot, 1 dessertspoonful cocoa, 1 tablespoonful sugar, 1½ cups boiling water.

Utensils.—Wooden spoon, basin.

Method.—

1. Blend arrowroot, sugar, and chocolate together in a basin.
2. Pour over sufficient boiling water to form a thick syrup.

Cup Pudding.

Materials.—One cup finely chopped suet, 1 cup sugar, 1 cup flour, 1 cup white bread crumbs, 1 cup mixed dried fruit, 1 teaspoonful spice, 1 teaspoonful carbonate of soda, 2 cooking apples, 1 egg or ¼ cup milk, ½ cup water, 1 tablespoonful of caramel (browned sugar and water).

Utensils.—Knife, bowl, wooden spoon, basin, pudding cloth or greased paper, saucepan or steamer.

Method.—

1. Peel and cut apples up finely; prepare dried fruit.
2. Put flour, sugar, breadcrumbs, dried fruit, spice, soda, apples, and chopped suet into a bowl.
3. Add egg or milk, water and caramel; mix well.
4. Put mixture into a greased basin; cover with pudding cloth, tied down securely or with greased paper.
5. Boil for three hours or steam for four hours.
6. Turn out; serve hot with sweet white sauce or custard.

French Apple Tart.

Materials for Pastry.—Six oz. flour, 3 oz. lard, 2 tablespoonfuls sugar, yolk of 1 egg, ¼ cup milk, 1 teaspoonful cinnamon.

Utensils.—Bowl, cup, whisk, rolling-pin, knife, tin plate.

Method.—

1. Rub lard, sugar, and salt into flour.
2. Mix with beaten yolk of egg and milk.
3. Turn out on floured board; knead; cut in half; roll out one part.
4. Cover a tin plate with this part; add apple mixture.
5. Roll out other part; cover the fruit; make a hole in centre; brush over; decorate.
6. Bake in a moderate oven thirty to forty minutes.
7. Sprinkle with sugar and cinnamon.

Apple Mixture.

Materials.—One lb. apples, ½ lemon, 2 tablespoonfuls sugar, 1 teaspoonful butter, 1 tablespoonful each of sultanas and currants, ¼ teaspoonful of spice, nutmeg, and cinnamon, 1 teaspoonful of sliced peel.

Utensils.—Saucepan, knife, wooden spoon, teaspoon, lemon squeezer, lemon grater.

Method.—

1. Put peeled and quartered apples into saucepan.
2. Add sugar, lemon juice and rind, butter, sultanas, currants, candied peel, nutmeg, spice, and cinnamon. Stew till apples are soft; stirring continuously.

Fruit Salad.

Method.—

1. If pineapple is used the stalk end should be cut off and the pulp separated from the core with a fork.
2. Fruit such as apples, pears, peaches, must be peeled, cores or seeds removed, and pulp cut up into small pieces; steel knives should not be used.
3. The pulp of passion fruit or granadillas must be scooped out of the shells.
4. Bananas should be cut into rings crossways, or thin slices lengthways; they must not be added to the other fruit until shortly before the salad is served.
5. When all other fruits are prepared they should be well mixed in a basin; the juice of half a lemon and sugar to taste should be added.
6. Fruit salad may be served in a large china or glass bowl or in small glass dishes with custard or cream; icing sugar is sometimes added.

Lemon Cheese.

Materials.—Two eggs, 2 oz. butter, 2 oz. sugar, juice of a lemon.

Utensils.—Saucepan, wooden spoon.

Method.—

1. Put yolks of eggs, sugar, lemon juice and butter into a saucepan.
2. Stir over fire till thick and smooth.

Jam Roly Poly.

Materials.—Eight oz. flour, 4 oz. suet, salt, ¾ teaspoonful baking-powder, ¼ cup water, jam or treacle.

Utensils.—Knife, sieve, bowl, board, rolling-pin, pudding cloth, string, pins, saucepan.

Method.—

1. Skin and chop up suet finely.
2. Sift flour, baking-powder, and salt into a bowl.
3. Rub suet into the flour with the tips of the fingers.
4. Add water slowly; mix into a dry dough.
5. Turn out on floured board; knead.
6. Roll out into an oblong shape about ¼ in. thick; spread with jam to about ½ an inch from the edges.
7. Roll up; press down outer edge and push ends in closely; place in the middle of a pudding cloth dipped in boiling water and sprinkled with flour.
8. Fold cloth round pudding; tie ends firmly with string; pin the cloth together at the middle.
9. Put into a saucepan of boiling water; boil for one and a-half to two hours; serve hot with white sauce.

Lemon Arrowroot Pudding.

Materials.—Half a cup sugar, 1 lemon, 2 tablespoonfuls arrowroot, 2 eggs, 1 dessertspoonful butter, 1 pint boiling water.

Utensils.—Bowl, wooden spoon, cup, knife, grater, whisk, pie dish, tablespoon.

Method.—

1. Blend arrowroot with a little cold water.
2. Add yolks of eggs well beaten, sugar, lemon juice, grated rind, and boiling water.
3. Mix butter well through; pour into a buttered pie dish.
4. When cold put the whites of eggs, stiffly beaten, with two tablespoonfuls sugar on top.
5. Put in a moderate oven until meringue is crisp and of a pale golden colour.

Lemon Sago, or Pineapple Sago.

Materials.—Half a cup sago, 2 lemons, 1 tablespoonful sugar, 2 tablespoonfuls golden syrup, 1 pint water—½ pint for soaking and ½ pint for cooking.

Utensils.—Saucepan, knife, squeezer, mould.

Method.—

1. Wash sago; soak two hours.
2. Wipe lemon; grate rind and squeeze juice into a basin.
3. Put water on to boil in a saucepan.
4. Add sago; cook till transparent, stirring occasionally.
5. Remove from fire; add lemon rind, juice, sugar, and syrup.
6. Pour into a mould; serve cold.

Notes.—

1. If lemons are not procurable a crystal of citric acid may be used.
2. Grated pineapple may be used instead of lemon.

Wholemeal Nut Loaf.

Ingredients.—Two cups wholemeal flour (finely ground), 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, 1½ tablespoons butter, 1 tablespoon sugar, ¼ cup nuts, ¼ cup raisins, ¼ cup sultanas, 1 tablespoon golden syrup 1 egg, 1 good cup milk.

Method.—Mix flour, sugar, cream of tartar and soda, and rub in butter; add nuts and fruit. Dissolve golden syrup in milk and add to well-beaten egg. Mix all together, put into greased tins with lids on, and bake about three-quarters of an hour in a moderate oven.

A raisin loaf without nuts can be made if desired.

Wheatmeal Fruit Cake.

Ingredients.—Half pound butter, ½ lb. sugar, 1 lb. fine wheatmeal, 6 eggs, 1 teaspoon cream of tartar, ½ teaspoon carbonate of soda, ¼ lb. chopped dates, 2 oz. nuts, ¼ lb. raisins, ¼ lb. currants, 1 oz. mixed peel.

Method.—Beat butter and sugar to a cream. Add eggs, one at a time, and beat for ten minutes. Add fruit, nuts and peel, and wheatmeal, cream of tartar, carbonate of soda, and a little milk if necessary. Put into greased tin and bake for one and a-half to two hours.

Wheat "Coffee."

Ingredients.—Three large cups of wheat, 2 tablespoons treacle, 1 tablespoon golden syrup, 3 teaspoons salt.

Method.—Wash wheat; drain and put into shallow baking dish, sprinkle salt on and mix in treacle and golden syrup, covering well all the wheat. Put into a hot oven and cook for one hour to one and a-half hours, stirring to prevent burning. When well cooked and the colour of the coffee bean when well roasted, remove from oven and allow to cool. Grind through wheat mill and store in sealed tins to keep in the strength.

Use one dessertspoonful of wheat "coffee" powder to each person, and add the hot milk to the coffee when ready to serve.

Summer Fruit Drinks.

Nothing is more refreshing or pleasing in warm weather than a well-prepared fruit drink, while from a health point of view the habit of drinking fruit juices needs no stressing. Their wholesomeness may be particularly emphasised as beverages for children, who, left to their own devices, are quick to acquire the taste for them. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious to the child's health.

The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice. Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

Pineapple Drink.—Wash the skin of pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly three-quarters of an hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

Fruit Punch.—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemon rind, 1 quart water, 3 or 4 cups of sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemon juice, rind, &c. To this add the following ingredients: (1) 1 quart ginger ale, ½ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

Fruit Cup.—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passion-fruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemons, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices of oranges, passion-fruit pulp and cut pear or other fruit. Place in ice chest and serve very cold.

WHAT WE OWE TO TREE PLANTERS.

"Redgum," writing in the "Sydney Morning Herald," has this to say on our debt to the people who plant trees:—

Every man and woman interested in the planting of trees for economic purposes or for beautification has reason to be pleased with the planting work that has been done during the season now drawing to a close.

Not for many years has so much attention been paid to the planting of ornamental trees on the roadways of the State (New South Wales). In parklands, also, splendid work has been done.

At Parkes, Albury, Peak Hill, Armidale, Tamworth, Orange, Blayney, Bathurst, Nowra, Lithgow, Blackheath, Springwood, Penrith, Fauleonbridge, West Maitland, Grafton, Blaxland, Crookwell, Manly, Collaroy, Katoomba, and Glenbrook additions have been made, or are to be made, to the arboreal beauty of the towns because the men who are working to bring their home areas into line with the new tree thought of the day, have realised that the only effective way of adding permanent and abiding beauty to Brewarrina, Bourke, Ballarat, or Braxton is to utilise the living loveliness of the trees that seem to find pleasure in the work which their worst enemy, man, now and again gives them to do.

These men are doing something that will one day make their towns more healthy, more beautiful, and more enjoyable. They are but following in the footsteps of the wise men of the yesterdays, who knew the value of trees.

Time and again it has been definitely stated that a town without trees is the town that is the easiest to forget.

It is the beauty of the open road, the parklands, and the town highways that wins favour to-day. Grafton is the best known town in the State, because of her jacarandas; Bathurst's Machattie Park endears her to thousands of travellers and tree lovers; Cook Park makes Orange memorable; a line of shapely poplars keeps Richmond from being forgotten; stately Lombardy poplars tell of Tumut's worth; Belmore Park, Goulburn's pride, is a jewel in jade; Lithgow's acalyphas are hard to forget; Fig Tree's giant scrub fig and its flame tree companion are the two best-known trees between Sydney and Kiama; Blackheath's scarlet oaks are unforgettable; Woollahra's Oriental plane trees add grace and dignity to the roadsides; Parramatta's old English oaks are joyous trees in the spring; and Wahroonga's grey-limbed planes tell their own sweet story to all who have time to interpret it from the signs in the limbs and the leaves.

I was almost forgetting the appeal that the Norfolk Island pines, growing on the ocean beach at Manly, make to the men and women who enjoy the strength and symmetry of such glorious wind and sea loving trees. No wonder that Manly stands alone. The Norfolk Island pine made her famous long before our boys and girls were permitted to tumble into the surf.

A LIVING ART.

The tree is the dominating factor in town and country landscape to-day. No town planning ever will be effective without arboreal embellishments. Tree planting is an art, building stores and Spanish bungalows is all science and solidity. Living decorations laugh at those we make of plaster and paint. If I read the signs on the roadsides aright—I have as good a chance of knowing what is happening in the world where trees and gardens count for something as the next man—to-day's tree planting movement is gaining its momentum because the glory and the beauty of our trees is creeping into the very souls of our men and women, and working, as beauty, love, and loyalty ever will do, a new regeneration in their lives. Love is irresistible. Form and colour are adorable. Spring's gaity and charm are enchanting. Sunlight and shadow are as indispensable as day and night, growing greenness and opening rosebuds are among the most poetic movements in life. Is it any wonder that our men and women are opening their homes and their hearts to the trees?

What really began this great latter-day regeneration, and so stirred the heart of the nation?

Canberra! Colourful, beautiful Canberra! The artist who did the tree planning and tree planting at Canberra opened up new highways into new tree lands that were never dreamed of before. He found the favoured area a wind-swept, brown-bodied sheep run, and left it a great national parkland, made superbly beautiful with trees.

Canberra increases in beauty every year with the natural growth of the sylvan subjects that have been brought together within her gates. This, with the soul that is centred in the capital, make the home of the Federation a city of enchantment. There is nothing to match it in the southern seas. And all because the man who had to do with the tree plantings was big enough in heart and mind to break away from the conventional methods of tree work, and develop new beauty with well-balanced plantings of colourful evergreen, deciduous, and flowering trees.

Canberra is a national influence to-day. Her radiations reach the ends of the continent, her inspirations are working into new forms of loveliness all over the land. How could it be otherwise?

Only a few weeks ago the Prime Minister (Mr. Lyons), with kindliness and good grace, took his place among the nation's tree planters and left a memory tree in splendid company at Faulconbridge, near to the home of the late Sir Henry Parkes, the founder of our Australian Federation. Not often have I seen so simple a ceremony enacted in so fine a spirit. The Prime Minister did the work as one who was greatly honoured to leave a tree in such a hallowed situation.

The Premier (Mr. Stevens) has his tree on the same landscape. Not far away King George's tree stands as the treasure tree of the Blue Mountain highways.

The 1934 tree planting season has been a triumph for the new-day tree planters and for the colourful deciduous and flowering trees. Canberra has been the inspiration behind the best of the work done during the year, for which the tree lovers are glad.

Orchard Notes for December.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown

and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Farm Notes for December.

ALTHOUGH November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of ensilage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state; consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise

considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taprooots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

A LAND LEVELLER.

HOME-MADE, BUT EFFICIENT.

The originator of the idea wrote as follows:—"The type of leveller shown on the top is very good for filling in small furrows. If it is not heavy enough for rough fallow, a log can be tied on the two iron distance pieces, or a board to stand on can be provided. For ordinary work three horses are sufficient. The paddock should be worked from corner to corner—diagonally. The leveller does good work before the drill, and it is better than the harrows for killing weeds, as it crushes them up, leaving the roots clean. A light implement does excellent work after the drill. I have used the leveller of the sort illustrated in the second sketch on this page with

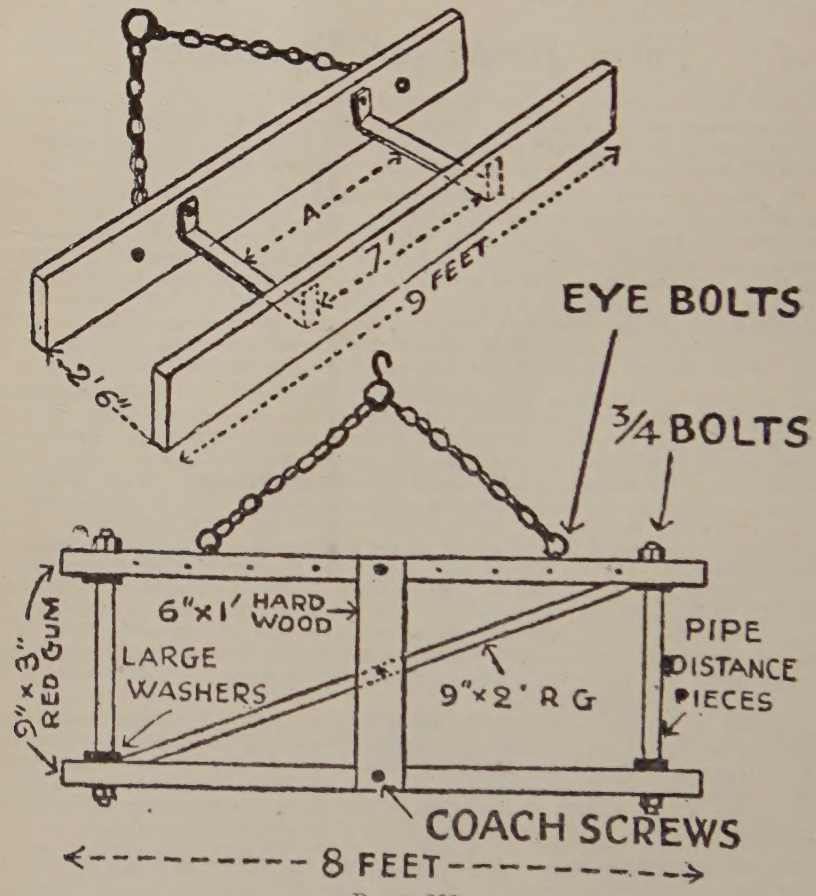

PLATE 283.

excellent results on fallow before breaking down. This levels and breaks all lumps on the top, and also loosens the soil before the scarifier or the cultivator. The front piece is studded with old bolts, driven in and allowed to project 2 in. The back piece can be treated the same way. On very hard or rough fallow it is necessary to stand on the implement, or use a seat. It can be weighted to suit dry ground, and takes four to five horses. It can be used in the same direction as the ploughing.—"The Canegrowers Weekly" (Mackay), Q.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1934.	Sept., 1933.		Sept.	No. of Years' Records.	Sept., 1934.	Sept., 1933.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	0·66	33	2·33	1·41	Clermont	1·05	63	0·18	1·92
Cairns	1·66	52	2·23	2·55	Gindie	1·13	35	0·06	5·27
Cardwell	1·54	62	1·92	4·02	Springsure ..	1·32	65	0·36	5·18
Cooktown	0·57	58	0·62	0·38					
Herberton	0·52	48	2·46	1·02					
Ingham	1·58	42	1·61	6·17					
Innisfail	3·49	53	5·48	4·90					
Mossman Mill ..	1·56	21	1·67	5·24	*Darling Downs.*				
Townsville	0·81	63	0·18	0·92					
Central Coast.					Dalby	1·69	64	0·80	2·83
					Emu Vale ..	1·76	38	1·67	1·91
					Hermitage ..	1·54	28	1·71	2·01
Ayr	1·41	47	0·15	2·40	Jimbour	1·50	46	0·69	1·99
Bowen	0·83	63	0·67	1·95	Miles	1·35	49	0·52	1·97
Charters Towers ..	0·85	52	0·02	3·02	Stanthorpe	2·28	61	2·93	2·20
Mackay	1·57	63	0·98	1·54	Toowoomba ..	2·15	62	0·91	2·34
Proserpine	2·17	31	1·18	5·41	Warwick	1·83	69	1·16	2·33
St. Lawrence ..	1·30	63	0.92	1·83					
South Coast.									
					Maranoa.				
Biggenden	1·56	35	0·95	2·97					
Bundaberg	1·60	51	0·74	1·21					
Brisbane	2·02	83	1·33	4·28	Roma	1·44	60	0·12	3·52
Caboolture	1·89	47	0·37	3·16					
Childers	1·86	39	0·71	3·27					
Crohamhurst ..	2·74	41	1·04	8·10					
Esk	2·13	47	0·94	2·13					
Gayndah	1·58	63	2·06	3·45					
Gympie	2·15	64	0·42	4·15	*State Farms, &c.*				
Kilkivan	1·72	55	1·03	3·30					
Maryborough ..	1·97	63	1·16	3·73	Bungeworgorai ..	1·02	20	0·11	2·94
Nambour	2·58	38	0·96	4·55	Gatton College ..	1·57	35	..	1·89
Nanango	1·86	52	0·80	4·51	Kairi	0·63	20	1·68	0·65
Rockhampton ..	1·35	63	0·30	1·01	Mackay Sugar Experiment Station	1·49	37	1·06	3·01
Woodford	2·24	47	0.55	5·07					

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·97	85	62	89	24	52	6	62	3
Herberton	..	75	55	88	29	44	6	246	9
Rockhampton	30·09	81	58	96	28	45	4	30	4
Brisbane	30·11	75	55	90	27	45	5	133	6
Darling Downs.									
Dalby	30·09	75	46	91	29	35	4	80	5
Stanthorpe	..	67	41	82	29	30	4, 14	293	11
Toowoomba	..	69	47	87	29	37	3, 8	87	5
Mid-Interior.									
Georgetown	29·99	89	63	98	30	53	3, 6	Nil	..
Longreach	30·05	85	54	104	29	39	7	Nil	..
Mitchell	30·09	77	44	97	29	32	4	31	3
Western.									
Burketown	29·99	88	64	97	23 24	52	7	Nil	..
Boulia	30·02	87	57	105	29	44	7	6	1
Thargomindah	30·06	79	54	97	29	43	7	15	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1934.		December. 1934.		MOONRISE. Nov. 1934.	Dec., 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·3	6·9	4·49	6·33	1·16	12·42
2	5·2	6·10	4·49	6·33	1·46	1·14
3	5·2	6·11	4·49	6·34	2·15	1·44
4	5·1	6·11	4·49	6·35	2·45	2·20
5	5·0	6·12	4·50	6·36	3·16	2·59
6	5·0	6·12	4·50	6·36	3·49	3·48
7	4·59	6·13	4·50	6·37	4·26	4·46
8	4·58	6·14	4·50	6·38	5·8	5·49
9	4·57	6·15	4·50	6·38	5·58	6·56
10	4·56	6·16	4·51	6·39	6·56	8·4
11	4·56	6·16	4·51	6·39	8 0	9·13
12	4·55	6·17	4·51	6·40	9·5	10·19
13	4·55	6·18	4·51	6·40	10·14	11·24
						p.m.
14	4·54	6·19	4·52	6·41	11·19	12·24
					p.m.	
15	4·54	6·20	4·52	6·41	12·23	1·26
16	4·53	6·21	4·52	6·42	1·25	2·26
17	4·52	6·21	4·52	6·43	2·26	3·27
18	4·52	6·22	4·53	6·44	3·28	4 28
19	4·52	6·23	4·53	6·44	4·30	5·28
20	4·51	6·24	4·53	6·45	5·34	6·22
21	4·51	6·25	4·54	6·45	6·35	7·12
22	4·51	6·26	4·54	6·46	7·35	7·59
23	4·50	6·27	4·55	6·46	8·30	8·39
24	4·50	6·28	4·55	6·47	9·20	9·13
25	4·50	6·28	4·56	6·47	10·4	9·46
26	4·50	6·29	4·56	6·48	10·41	10·15
27	4·50	6·29	4·57	6·48	11·16	10·43
28	4·49	6·30	4·58	6·49	11·47	11·10
29	4·49	6·30	4.59	6.49	a.m.	11·40
30	4·49	6·31	4·59	6·50	12·14	a.m.
31			5·0	6·50		12·13

Phases of the Moon, Occultations, &c.

7 Nov.	● New Moon	2	44 p.m
14 ,,	☾ First Quarter	12	39 p.m.
21 ,,	○ Full Moon	2	26 p.m.
29 ,,	☽ Last Quarter	3	59 p.m.

Perigee, 12th November, at 12.45 p.m.
Apogee, 28th November, at 12.18 a.m.

The apparently very near approach of Venus to Jupiter would be most remarkable on November 1st and 2nd if it were not for their nearness to the Sun, which will rise only 16 minutes after the planets.

On the 3rd, Mercury will pass nearly between the Earth and the Sun, but being about half a degree further south will not cross the Sun's face. On the next day Mercury will pass from west to east of Venus, which will be about 1 degree north of it.

When Jupiter rises on the 7th about 4.20 a.m. Mercury will be passing from west to east of it, about a third of a degree on its southern side.

On the 11th, Mars and Neptune will be in the same part of Leo, near the border of Virgo within 1 degree of each other, but with an actual distance of more than 2,500 million miles.

On the 14th, at 4 p.m., Saturn will be only 3 degrees (half the length of the Southern Cross) south of the Moon in its first quarter, in the north-east; a spectacle for telescope or binoculars will then be afforded.

On the 18th, Venus will be on the far side of its orbit beyond the Sun, but about half a degree to the north of it, and about 160 million miles from the Earth. Venus will therefore be unobservable in November.

Mercury will take its place as a morning star, having its greatest elongation 19 degrees west of the Sun, on the 19th.

On the 21st at 4 a.m., Mercury will be apparently within three diameters of the Moon north of Jupiter, which will be an interesting spectacle for those using telescope or binoculars.

Mercury will set 24 minutes after the Sun on the 1st; on the 15th it will rise at 4.1 a.m. or 53 minutes before the Sun.

Venus will rise at 4.52 a.m., or 11 minutes before the Sun on the 1st, and only 5 minutes before it in the 15th.

Mars will rise at 2.16 a.m. on the 1st and at 1.43 a.m. on the 15th.

Jupiter will rise at 4.55 a.m. and set at 5.53 p.m. on the 1st; on the 15th it will rise at 4.9 a.m. and set at 5.13 p.m.

Saturn will rise at 12.16 p.m. and set at 1.30 a.m. on the 1st; on the 15th it will rise at 11.20 a.m. and set at 12.37 a.m.

7 Dec.,	● New Moon	3	25 a.m.
13 ,,	☾ First Quarter	8	52 p.m.
21 ,,	○ Full Moon	6	53 a.m.
29 ,,	☽ Last Quarter	12	8 p.m.

Perigee, 9th December, at 6 p.m.
Apogee, 25th December, at 7.36 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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